Chapter 4
Environmental Consequences

St. Mary Bridge under construction, showing ring stone being placed

John Zoss, Final Construction report (1934-1935) on St. Mary's River in "Development & Maintenance: Report; Situation" folder 6, box 116, GNPA

INTRODUCTION

This chapter provides an analysis of the potential environmental effects of the preferred alternative and other alternatives on the resources discussed in Chapter 3. Potential impacts were identified for each of the alternatives based on a review of relevant scientific literature, previously prepared environmental documents, field investigations, and the best professional judgment of Park and other resource specialists.

Included in this chapter is a discussion of the methods that were used to identify and evaluate the types and degree of impact for each of the resources. This chapter is organized by resource, and is the scientific and analytical basis for the comparison of alternatives. Resource impacts are often similar between alternatives, but differences in impacts are identified and compared as appropriate. This chapter should be reviewed jointly with Chapter 2, which identifies the alternatives and mitigation measures that would be implemented by the NPS to avoid or minimize environmental effects. In addition, the impact analysis for each alternative is used as the basis for consideration of potential impairment to Park resources and values, as required by NPS Management Policies and Director's Order 12.

METHODS

The determination of impacts is evaluated at several levels. Impacts are described in terms of:

Type: Either beneficial or adverse. Unless otherwise noted as beneficial, impacts are adverse.

Intensity: The intensity of the impacts varies for each resource and ranges from negligible, to minor, to moderate, to major. Threshold descriptions for the intensity of impacts are described in Table 29.

Context: Effects are 1) site-specific at the location of the action; 2) localized in the general vicinity of the action; 3) widespread throughout the Park; or 4) regional outside of the Park.

Duration: Effects are either short term or long term. Defining short- and long-term effects for the proposed rehabilitation of the Road is complicated by the fact that all alternatives require multiple years to complete, with rehabilitation work ranging from 6 to 50 years. In addition, the work on the Road, while concentrated in the Alpine section, would be conducted throughout its 50-mile (80-kilometer) length. Thus in any given year, different segments of the Road would undergo rehabilitation. Because of the varying types of impacts, the duration for determining whether an impact is short term or long term varies by resource and is further defined in Table 29.

Impacts are also identified as direct, indirect or cumulative. Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed from the place, but are still reasonably foreseeable. Cumulative impacts are further described in the following section.

CUMULATIVE EFFECTS

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over time. The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act, require assessment of cumulative impacts in the decision making process for federal projects. Cumulative impacts are considered for all alternatives including No Action.

Cumulative effects were determined by combining the impacts of each alternative with potential other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or foreseeable future projects within or near Glacier National Park. Reasonably foreseeable future activities analyzed in this EIS are those actions independent of rehabilitation of the Going-to-the-Sun Road. The cumulative effects analysis area includes GNP; Flathead, Glacier, and Lake counties; and southwest Alberta, as appropriate for each resource. Past actions and reasonably foreseeable activities that may have a cumulative impact are discussed below and an analysis of cumulative effects is included in subsequent sections for each resource.

Table 29. Impact threshold definitions and duration.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
SOCIOECONOMIC RESOURCES	No effects would occur or the effects to socioeconomic conditions would be below or at the level of detection. The effect would be slight and no long-term effects to socioeconomic conditions would occur.	Effects to socioeconomic conditions may be detectable, but within the range of typical year to year variations under existing circumstances. Effects unlikely to persist substantially beyond the duration of direct actions under the alternatives.	Effects to socioeconomic conditions would be readily apparent and somewhat greater than typical year-to-year variations. Effects unlikely to persist substantially beyond the duration of direct actions under the alternatives.	Effects to socioeconomic conditions would be readily apparent and likely at least twice as large as typical year-to-year variations.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.
ARCHEOLOGICAL RESOURCES	Impact is at the lowest levels of detection — barely measurable with no perceptible consequences, either adverse or beneficial, to archeological resources. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact —** disturbance of a site(s) is confined to a small area with little, if any, loss of important information potential. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact** — preservation of a site(s) in its natural state. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact** — disturbance of the site(s) would not result in a substantial loss of important information. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact** — stabilization of the site(s). For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact** — disturbance of the site(s) is substantial and results in the loss of most or all of the site and its potential to yield important information. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact —** active intervention to preserve the site. For purposes of Section 106, the determination of effect would be no adverse effect.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
HISTORIC	Impact(s) is at the lowest levels of detection - barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact** — impact would not affect the character defining features of a National Register of Historic Places eligible or listed structure or building. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact —** stabilization/preservation of character defining features in accordance with the Secretary of the Interior's *Standards*, to maintain existing integrity of a structure or building. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact** — impact would alter a character defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact —** restoration in accordance with the Secretary of the Interior's *Standards*, to accurately depict the form, features, and character of a structure or building as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact —** impact would alter a character defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact** — rehabilitation of a structure or building in accordance with the Secretary of the Interior's *Standard*, to make possible a compatible use of the property while preserving its character defining features. For purposes of Section 106, the determination of effect would be no adverse effect.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
ETHNOGRAPHIC	Impact(s) would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices. There would be no change to a group's body of beliefs and practices. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.	**Adverse impact** — impact(s) would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect. **Beneficial impact** — would allow traditional access and/or accommodate a group's traditional practices or beliefs. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.	**Adverse impact** — impact(s) would be apparent and would alter resource conditions. Something would interfere with traditional access, site preservation, or the relationship between the resource and the affiliated group's beliefs and practices, even though the group's beliefs and practices would survive. For purposes of Section 106, the determination of effect on TCPs would be adverse effect. **Beneficial impact —** would facilitate a group's beliefs and practices. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.	**Adverse impact** — impact(s) would alter resource conditions. Something would block or greatly affect traditional access, site preservation, or the relationship between the resource and the affiliated group's body of beliefs and practices, to the extent that the survival of a group's beliefs and/or practices would be jeopardized. For purposes of Section 106, the determination of effect on TCPs would be adverse effect. **Beneficial impact** — would encourage a group's beliefs or practices. For purposes of Section 106, the determination of effect on TCPs would be no adverse effect.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
CULTURAL LANDSCAPE	Impact(s) is at the lowest levels of detection - barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact —** impact would not affect the character defining features of a National Register of Historic Places eligible or listed cultural landscape. **Beneficial impact —** preservation of character defining features in accordance with the Secretary of the Interior's *Standards*, to maintain existing integrity of the cultural landscape. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact** — impact would alter a character defining feature(s) of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility is jeopardized. For purposes of Section 106, the determination of effect would be no adverse effect. **Beneficial impact —** rehabilitation of a landscape or its features in accordance with the Secretary of the Interior's *Standards*, to make possible a compatible use of the landscape while preserving its character defining features. For purposes of Section 106, the determination of effect would be no adverse effect.	**Adverse impact —** impact would alter a character defining feature(s) of the cultural landscape, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. For purposes of Section 106, the determination of effect would be adverse effect. **Beneficial impact** — restoration in accordance with the Secretary of the Interior's *Standards*, to accurately depict the features and character of a landscape as it appeared during its period of significance. For purposes of Section 106, the determination of effect would be no adverse effect.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.
TOPOGRAPHY, GEOLOGY, AND SOILS	There would be no perceptible change to the landscape or geologic formations. Soils would not be affected or the effect would be below or at the lower end of detection. Any effects to soil productivity or fertility would be slight and no long-term effects to soils would occur.	The effects to the landscape, geologic formations, and soils would be detectable. Changes to the landscape and geologic features would be small in size and area. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.	The effect to the landscape, geology, and soils would be readily apparent. Effects would result in a change to the landscape, geology, and soil character over a relatively wide area or multiple locations. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.	The effect on the landscape, geology, and soils would be readily apparent and would substantially change the character of these resources over a large area. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.	Short term—Effects last less than 3 years. Long term—Effects last more than 3 years.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
WATER RESOURCES AND WATER QUALITY	Neither water quality nor hydrology would be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight and local. No mitigation measures would be necessary.	Changes in water quality or hydrology would be measurable, although the changes would be small and the effects would be localized. Minor mitigation measures would be necessary and successful.	Changes in water quality or hydrology would be measurable but would be relatively local. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.	Changes in water quality or hydrology would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.	Short term—Effects last less than 1 year. Long term—Effects last more than 1 year.
FLOODPLAINS	Floodplains would not be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight, local, and would likely be short term.	Changes in floodplains would be measurable, although the changes would be small and the effects would be localized. Mitigation measure associated with water quality or hydrology would be necessary.	Changes in floodplains would be measurable and long term but would be relatively local. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.	Changes in floodplains would be readily measurable, have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.	Short term—Effects last less than 1 year. Long term—Effects last more than 1 year.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
VEGETATION	No native vegetation would be affected or some individual native plants could be affected, but there would be no effect on native species populations. The effects would be short term, on a small scale.	Some individual native plants would be affected over a relatively small area and minor portion of that species' population. Mitigation to offset adverse effects could be required and would be effective. A minor introduction or spread of non-native plant species is possible over a small area and eradication or control would be easily achieved.	Some individual native plants would be affected over a relatively wide area or multiple sites and would be readily noticeable. There would be limited impact to the species population, but for individual species, a sizeable segment of the species' population could be affected in the long term. Mitigation to offset adverse effects could be extensive, but would likely be successful. The introduction or spread of non-native plant species would occur at multiple locations and extensive weed control measures would need to be implemented, but results would be successful.	A considerable long-term effect on native plant populations would occur over a relatively large area. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed. A widespread introduction or spread of non-native plant species would occur resulting in the need for aggressive weed control and the likely long-term establishment of exotic species.	Short term—Effects last less than 3 years. Long term—Effects last more than 3 years.
WETLANDS	Wetlands would not be directly affected. Incidental indirect impacts would be slight and not measurable. No mitigation would be necessary.	A minor temporary impact on wetlands of less than 1 acre would occur. Affected wetlands would be readily restored with no long-term loss in function or values.	A direct loss of wetlands of 1 to 3 acres would occur. Wetland mitigation would be required to replace the impacted wetland. Mitigation measures would be extensive, but likely successful.	The direct loss of more than 3 acres of wetlands would occur. Extensive mitigation measures would be required to replace impacted wetlands and their success would not be guaranteed.	Short term—Effects last less than 3 years. Long term—Effects last more than 3 years.
WILDLIFE AND AQUATIC RESOURCES	Wildlife and aquatic resources would not be affected or the changes would be so slight that they would not be of any measurable or perceptible consequence to the species' population.	Effects to individual wildlife and aquatic species are possible, although the effects would be localized, and would be small and of little consequence to the species' population. Mitigation measures, if needed to offset adverse effects, would be simple and successful.	Effects to individual wildlife and aquatic species are likely and localized, with consequences at the population level. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.	Effects to wildlife and aquatic resources would have substantial consequences to species populations in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN	No federally listed species would be affected or an individual of a listed species or its critical habitat would be affected, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. Negligible effect would equate with a "no effect" determination in U.S. Fish and Wildlife Service terms.	An individual(s) of a listed species or its critical habitat would be affected, but the change would be small. Minor effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "not likely to adversely affect" the species.	An individual or population of a listed species, or its critical habitat would be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. Moderate effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely…" or "not likely to adversely affect" the species.	An individual or population of a listed species, or its critical habitat, would be noticeably affected with a long-term, vital consequence to the individual, population, or habitat. Major effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely to adversely affect" the species or critical habitat.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.
AIR QUALITY	There would be no measurable change in existing air quality or visibility.	An introduction of solid airborne pollutants would occur. There may be slight detectable impacts to visibility at localized sites.	An introduction of airborne pollutants would be readily measurable. Impacts to visibility would be readily observable and widespread.	An introduction of airborne pollutants would be readily measurable. Visibility in the Park or surrounding areas would be reduced and air quality standards may be exceeded.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation.
VISUAL RESOURCES	No fixed, short-term or long-term changes to the views of or from the roadway corridor would occur. Some transient visual changes may occur, caused by temporary alterations in vehicular traffic patterns or by the movement of equipment.	Changes to visual resources would be short term and non-substantive only, and would be limited to the immediate right-of-way of the Road. Only limited mitigation or interpretive measures would be required.	Short-term changes to visual resources may occur both within and beyond the roadway right-of-way, but long-term changes would be limited to the roadway corridor itself. Substantive changes would be limited to a small number of major project sites. Mitigative and interpretive measures would be required to offset long-term changes.	Both short-term and long-term changes may occur both within and beyond the roadway corridor, and some of these changes may be substantive throughout. Significant mitigation and interpretations would be required, but would not be able to wholly compensate for the changed resources.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the rehabilitation period.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
NATURAL SOUNDSCAPE AND LIGHTSCAPE	There would be no introductions of artificial noise or light into the Park.	A short-term introduction of artificial noise and light would occur at localized sites. The effect would be readily detectable, but would not adversely affect Park visitors or wildlife.	A widespread introduction of noise and light would be readily detectable and would adversely affect nearby visitors and wildlife.	A long-term introduction of noise and light would occur that would adversely affect visitors and wildlife.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the Road rehabilitation period.
WILDERNESS AND WILD AND SCENIC RIVERS	There would be no effect on the proposed wilderness status of Park lands or effects to wild and scenic river use or designation.	An indirect disturbance to wilderness values or wild and scenic river use may occur from project actions.	A direct loss or disturbance to proposed wilderness lands or wild scenic rivers would occur.	A loss or disturbance to proposed wilderness lands or wild and scenic river designation would occur. Wilderness and wild and scenic river values would be diminished.	Short term—Effects extend only through the period of Road rehabilitation. Long term—Effects extend beyond the Road rehabilitation period.
ENVIRONMENTAL JUSTICE	Socioeconomic resource impacts would be negligible and/or share of impacts borne by low income areas is not significantly larger than the study area average.	Socioeconomic resource impacts would be minor and share of impacts borne by low income areas is significantly larger than the study area average.	Socioeconomic resource impacts would be moderate and share of impacts borne by low income areas is significantly larger than study area average.	Socioeconomic resource impacts would be major and share of impacts borne by low income areas is significantly larger than the study area average.	

Past Actions

A variety of past activities, including the original construction of the Going-to-the-Sun Road, have modified resources in the project area. Other principal developments along the Road include campgrounds, lodges, visitor centers, boating facilities, parking areas, and trails. Outside the Park, the natural environment has been modified by roads, residential and commercial development, agricultural practices, water storage projects, and other land use changes. The description of the affected environment in Chapter 3 is the baseline condition of resources as modified by past actions.

Reasonably Foreseeable Activities

There are several reasonably foreseeable activities that, in conjunction with the proposed rehabilitation of the Going-to-the-Sun Road, may result in cumulative effects. For the purpose of this analysis, cumulative effects from actions likely to occur within the next 10 years have been considered.

Reasonably foreseeable activities located outside of the Park include regional highway and transportation projects, National Forest activities, and regional population growth. The cumulative effect of these activities relate primarily to visitor use and experience and the regional and local economy with limited impact on natural or cultural resources. The same is true for Lewis & Clark Bicentennial Commemoration activities and the Glacier National Park Centennial anniversary, which may result in a temporary increase in Park visitation. Activities within the Park potentially affecting natural and cultural resources include other Park transportation projects and facility improvements. Table 30 summarizes the reasonably foreseeable activities within a 10-year window, and Figure 22 shows their geographic extent. Reasonably foreseeable activities are discussed below.

Highway and Transportation Projects Outside the Park

Several highway reconstruction, rehabilitation, and paving/surfacing projects are planned on roads outside of GNP. Some of these roads are primary travel routes to the Park and could affect visitor access or add to construction delays. Most reconstruction efforts would maintain 2-lane, 2-way traffic, although extended delays may be needed for some projects.

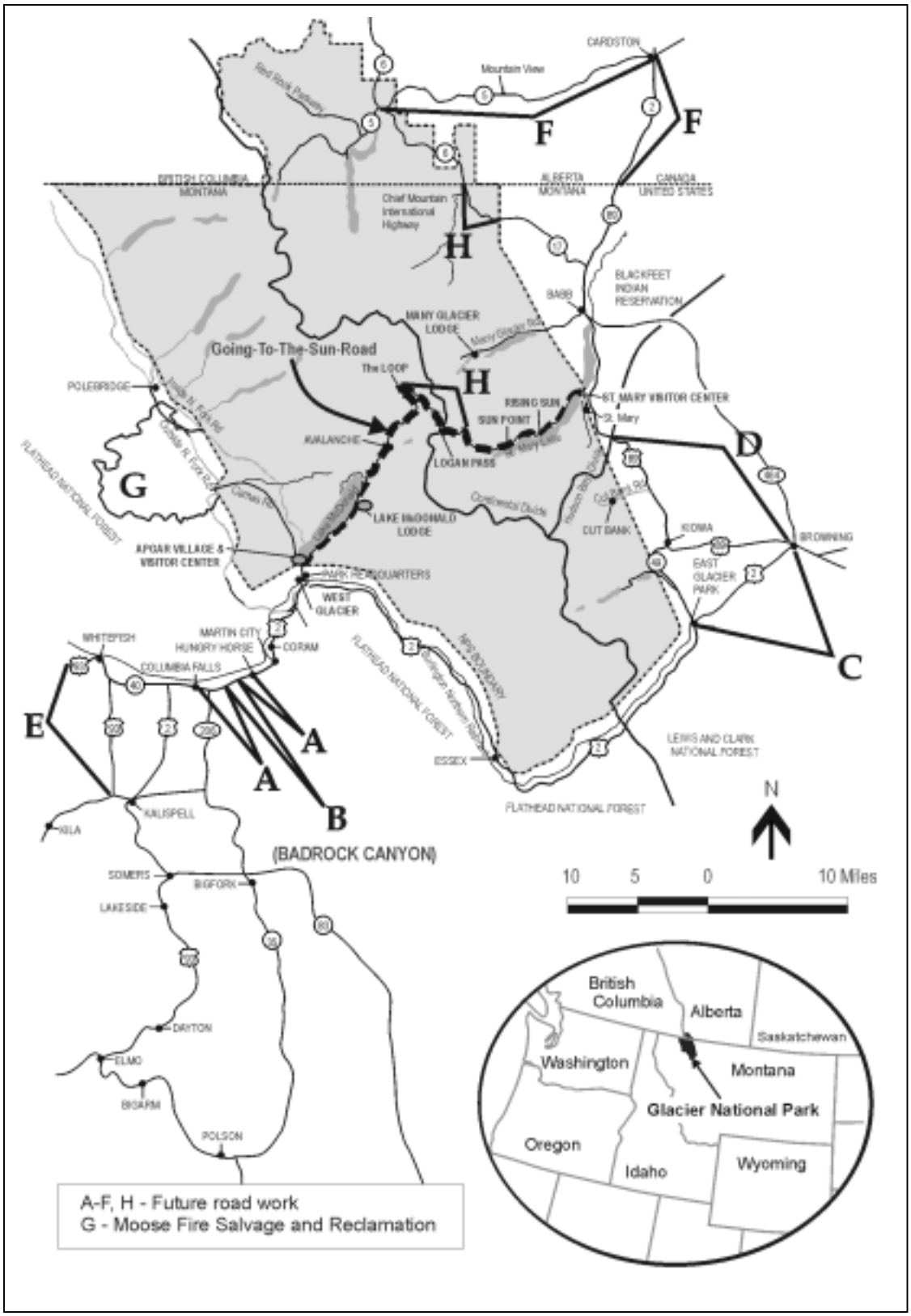
Highway 2, which provides access to both the West and East Entrances to the Park, has several segments planned for reconstruction. A 2-mile (3-kilometer) segment of Highway 2 from Columbia Falls east to Badrock Canyon is planned for reconstruction in 2003 (Figure 22, Segment A). Roadwork on Highway 2 between Hungry Horse and Badrock Canyon is scheduled to begin in 2005 and continue through 2006. According to MDOT, the reconstruction should not result in significant delays because 2-lane, 2-way traffic flows would be maintained (Brazda, pers. comm. 2002). Reconstruction of a 1.5-mile (2.4 kilometer) portion of Highway 2 within Badrock Canyon has not been scheduled, but implementation likely would occur within the next 10 years (Figure 22, Segment B). Work on the Badrock Canyon segment could cause substantial travel delays. Rock blasting may necessitate temporary road closures for up to 2 hours. Minor resurfacing projects are planned for other portions of Highway 2 in the vicinity of GNP, and 2-lane, 2-way traffic would be maintained during most of these projects (Brazda, pers. comm. 2002).

Table 30. Reasonably foreseeable future actions.

Map ID*	Action	Location	Schedule	Planned activity
Regional Highway and Transportation Projects				
A	Highway 2 reconstruction	Columbia Falls to Badrock Canyon and Badrock Canyon to Hungry Horse	2003; 2005 to 2006	Highway reconstruction on entry road to GNP; 2-lane, 2-way traffic maintained with minimal traffic delays
B	Highway 2 reconstruction	Badrock Canyon	2006 to 2010	Highway reconstruction on entry road to GNP; 2-hour blasting delays possible
C	Highway 2 reconstruction	Blackfeet Reservation	2002 to 2009	Highway reconstruction on entry road to GNP; 2-lane, 2-way traffic maintained with minimal delays
D	Highway 89 reconstruction	Blackfeet Reservation	2002 to 2012	Highway reconstruction on entry road to GNP; 2-lane, 2-way traffic maintained with minimal delays
E	Highway 93 reconstruction	Kalispell, Whitefish	2003 to 2006	Highway reconstruction; 2-lane, 2-way traffic maintained with minimal delays
F	Alberta Highways 2 and 5	Alberta, Canada	2002 to 2004	Paving and intersection widening; minimal delays
National Forest Activities				
G	Timber sales and forest rehabilitation	Flathead National Forest	2002 to 2005	Additional logging truck activity during salvage activities; forest rehabilitation efforts associated with the Moose fire
Glacier National Park Activities				
H	Roadwork	GNP	2004 to 2006	Retaining wall repairs on alpine sections of the Road and roadwork on Chief Mountain slide (State Highway 17)
—	Planned and proposed visitor use improvements	GNP	2004 to 2012	Multiple improvements to existing facilities at Apgar Village, Lake McDonald Lodge, Rising Sun, Many Glacier, Swiftcurrent, and other service areas in the Park
—	GNP Centennial activities	GNP	2010	Possible increase in visitors to GNP and the region
Regional Activities				
—	Lewis & Clark Bicentennial activities	GNP, adjoining communities	2005 to 2006	Possible increase in visitors to GNP and the region
—	Population growth	Northwest Montana	On-going	Possible increase in visitors to GNP and the region

*See Figure 22 for geographic extent of these actions.

Figure 22. Geographic extent of reasonably foreseeable activities.



Portions of Highway 2 on the Blackfeet Reservation east of GNP also are proposed for reconstruction or resurfacing activities (Figure 22, Segment C). The Two Medicine River Bridge near East Glacier National Park will be under reconstruction from 2002 to 2007. Reconstruction on portions of Highway 2 between Browning and Cut Bank will be completed between 2002 and 2009. Minor traffic delays are anticipated for these projects (White, pers. comm. 2002; Johnson, pers. comm. 2002).

There are two scheduled projects on Highway 89 through the Blackfeet Reservation between 2002 and 2012 (Figure 22, Segment D). Highway 89 provides access to GNP along the east side of the Park. The first segment of Road improvements is from Browning north to the Hudson Bay Divide, which is about 8 miles (13 kilometers) south of the town of St. Mary. The second segment is the 10-mile section from Browning south to the Two Medicine River. Some traffic delays are anticipated with both reconstruction projects (White, pers. comm. 2002; Harris, pers. comm. 2002; Johnson, pers. comm. 2002).

Portions of Highway 93 between Kalispell and Whitefish are scheduled for reconstruction between 2003 and 2006 (Figure 22, Segment E). Two planned projects that may potentially cause minor delays are planned within or immediately adjacent to the town of Kalispell. A third project on Highway 93, near the town of Whitefish, is scheduled to begin in about 2006. This is a full reconstruction project and may result in minor traffic delays. Several other traffic projects are planned through 2006, but traffic flow would be maintained and delays would be minimal (Johnson, pers. comm. 2002; Brazda, pers. comm. 2002).

Two Canadian highways managed by the Government of Alberta, Transportation Department, have planned road projects between 2002 and 2004. Planned roadwork includes road reconstruction of Highway 2, which links the Alberta town of Cardston to Highway 89 in Montana and paving and intersection widening for Highway 5, an east/west corridor connecting WLNP and the town of Cardston (Mondeville, pers. comm. 2002).

National Forest Activities

Activities on Flathead National Forest, which is located south and west of GNP, also may result in cumulative effects. Timber sales to salvage areas damaged by the 2001 Moose fire may occur between 2002 and 2005 and would result in increased truck traffic on the Outside North Fork Road and Highway 2 (Figure 22, Area G) (Carlin, pers. comm. 2002). In addition, forest rehabilitation of the burn area may result in increased traffic and heavy machinery on area roads (Rowley and DeHerrera 2001).

Glacier National Park Activities

Construction work on the Going-to-the-Sun Road and other road segments within GNP is planned for 2004 to 2006, and includes retaining wall repair (Going-to-the-Sun Road) and slide remediation on the Chief Mountain Road (Figure 22, Segment H).

Improvements at Apgar near West Glacier are expected to be implemented from 2004 to 2006. Roads, parking, and trails would be rehabilitated within the existing visitor service zone.

The Park is also developing a *Commercial Services Plan* to direct concession operations, which include a variety of visitor use services such as lodging, retail sales, private vehicle transits, and horseback riding over the next 10 years. A decision on which components of the CSP would be implemented or if the Plan would be implemented is not expected until 2003.

Special Events

Two forthcoming special events may impact the number of visitors and traffic to GNP.

Lewis & Clark Bicentennial Commemoration. The years 2005 and 2006 will mark the 200th anniversary of the passage of Lewis and Clark through Montana. Studies on behalf of the Montana Tourism Advisory Council and the Institute for Tourism and Recreation Research at the University of Montana project the Commemoration will result in a large increase in the number of out-of-state visitors to Montana. Under various scenarios, these studies suggest an increase in annual out-of-state visitors from approximately 9 million visitors at present to between 12 and 16 million per year between 2005 through 2006. (Estimation and Awareness Study 2001).

Glacier National Park Centennial. Year 2010 will mark the 100th anniversary of the establishment of Glacier as a national park. At present, the GNP Centennial is not anticipated to be a major tourist draw comparable to the Lewis & Clark Bicentennial Commemoration. (Haverfield, pers. comm. 2002; Edgar, pers. comm. 2002; Miller, pers. comm. 2002).

Regional Population Growth

Portions of the study area experienced substantial population growth during the 1990s. Both Flathead County and Lake County are projected to continue to grow more rapidly over the next 25 years than the statewide average growth rate, although growth is expected to be slower in the future than during the past decade. Total population of the Montana portions of the study area is expected to increase from 92,403 in 2000 to 114,225 by 2025 (see Chapter 3 for further information).

IMPAIRMENT OF PARK RESOURCES AND VALUES

In addition to determining the environmental consequences of the preferred and other alternatives, NPS policy requires analysis of potential effects to determine whether actions would impair park resources (USDI 2001).

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;

- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's GMP or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

SOCIOECONOMIC RESOURCES

The following section of this chapter describes potential impacts of rehabilitation of the Going-to-the-Sun Road on the socioeconomic environment. The focus of this discussion is primarily on the study area, which includes three Montana counties (Flathead County, Glacier County, and Lake County) as well as southwest Alberta (Census District 3). Potential statewide impacts in Montana are also discussed.

This section addresses the following topics:

- Methodology for socioeconomic assessment
- Projected impacts on visitation, visitor experience, and local spending
- Projected economic impacts from construction activity
- Project impacts on Park operations
- Fiscal and community impacts
- Environmental justice
- Cumulative impacts
- Summary and comparison of direct and indirect socioeconomic impacts from Road rehabilitation

Methodology for Socioeconomic Assessment

Over the past several years, public comments at scoping meetings, the work of the CAC, and the socioeconomic studies prepared for GNP by Washington Infrastructure Services have consistently identified two primary areas of potential socioeconomic impact associated with Going-to-the-Sun Road rehabilitation. These areas are reductions in visitor spending and increases in construction activity. A third area, potential changes in Park operations, has not been a major topic of previous discussion or examination, but is also addressed below. The study area for the socioeconomic analysis as described in Chapter 3 includes Flathead, Glacier, and Lake counties, Montana, and the southwestern Alberta municipal districts of Willow Creek, Pincher Creek, and Cardston.

Potential changes in the quality of the visitor experience at GNP during construction cannot be directly quantified. However, these changes in visitor experience can be directly linked to visitor behavior based on responses to the 2000 Survey of Visitors. In particular, a proportion of the 2000 visitors surveyed indicated they would not visit the Park under conditions anticipated under some of the rehabilitation alternatives. Further, visitors surveyed in 2000 also provided responses to questions indicating the potential effectiveness of mitigation strategies. These proportionate responses to traffic disruption and the mitigation measures described in Chapter 2, along with projections of baseline visitation described in Chapter 3, were used to quantify anticipated changes in visitation resulting from the alternatives.

In particular, visitor day estimates for Alternatives 2, 3 and 4 were estimated as reductions from the baseline established by Alternative 1. Such visitor day reductions were calculated by multiplying the

number of parties that decide to either 1) completely cancel their trip to GNP or 2) significantly reduce the length of their trip as a result of Road rehabilitation, times the average party size and the average trip length.

Responses to specific questions from the 2000 visitor survey were used in conjunction with the number of baseline visitors during the applicable seasons to estimate visitation changes for each alternative. For example, the number of parties canceling their trips under Alternative 3 was estimated from:

1) the number of survey respondents that said they would not visit GNP if they knew in advance of significant construction delays on the Road, applied to the number of baseline visitors during peak visitation months, and

2) the number of survey respondents that said they would not visit GNP if they knew in advance that there would be traffic suspensions on portions of the Road, applied to the number of baseline visitors during shoulder seasons.

For Alternative 4, the number of parties canceling their trips was estimated from survey responses to traffic suspensions, applied to the number of baseline visitors during the week for both the peak and shoulder seasons. A reduction in visitation was also estimated for weekend visitors when there would only be traffic delays. Visitor reductions under alternative 4 are thus much larger than under Alternative 3 both because the negative survey response to traffic suspensions is greater than the negative response to road delays, and because Alternative 4 assumes traffic suspensions throughout the visitor use season when the Road is normally open.

For Alternatives 3 and 4, negative visitor impacts associated with road rehabilitation were assumed to be partially offset by visitor service mitigation efforts. In a similar fashion, responses to relevant questions from the 2000 visitor survey were used to estimate the mitigating impacts of visitor service improvements.

Profiles of typical visitor expenditures, by day, were then applied to changes in visitation to estimate direct impacts on sales (output) in the surrounding regional economies. In calculating impacts on the regional economy within the study area, only expenditures by non-local visitors were included. It was also assumed, based on responses to the 2000 Survey of Visitors, that non-local visitors who opt to not visit GNP during Road rehabilitation also would not come to the study area for other reasons.

The direct impacts from additional construction expenditures were estimated by developing estimates of labor and goods and service purchasing requirements from the cost projections for each alternative developed by Washington Infrastructure Services, Inc. Interviews with Park staff, FHWA and local Job Service representatives were used to estimate the proportion of these jobs and purchasing needs that would be filled within the study area economy.

The analysis of direct impacts on visitation and from construction resulted in a quantification of the anticipated changes in study area output (sales) and employment associated with each alternative. These direct effects were then incorporated into the regional economic modeling system originally developed by the U.S. Forest Service, IMPLAN, in order to estimate secondary (indirect and induced) economic impacts associated with changes in visitation and additional construction activity. Again, these impacts are presented in terms of jobs and annual output (sales) within the study area and across the state of Montana.

Potential environmental justice issues were evaluated according to their definition under Executive Order 12898, dated February 11, 1994. The Executive Order calls for identification of minority and low-income populations within the impact area, which was achieved based on comparison of socioeconomic data for portions of the study area relative to the State of Montana as a whole. The Executive Order then calls for determination of whether these areas would bear disproportionate impacts from the proposed action, which was evaluated based on projected net economic effects of the alternatives on the minority and low-income populations within the study area, relative to projected net economic effects of the alternatives across the study area as a whole.

Further details on the methods, models, and assumptions used for this analysis are included in Appendix B.

Projected Impacts on Visitor Experience, Visitation, and Local Spending

As described in Chapter 3, in a typical year there are more than 1.5 million recreational visits to GNP. (A recreational visit is equivalent to one person participating in any recreational activity during a visit to GNP. This includes activities such as sightseeing, touring, and driving, and is not directly related to any time period.) Spending by these visitors for lodging, food, gasoline, souvenirs, and other items is an important part of the economic base in the study area.

Responses to the 2000 visitor survey indicated that a proportion of the people who visit the Park might not make such a visit if rehabilitation limits access to portions of the Road or results in substantial delays (WIS 2001b). Further, some visitors who would still come to the Park under such conditions might shorten their stay in the area. The following section summarizes the projected effects of each Road rehabilitation alternative on the visitor experience at GNP and the corresponding direct and secondary impacts on visitor use and experience, and local economic conditions. For Alternative 1, baseline projections of visitation, visitor expenditures, and the local job base supported by these expenditures are presented. For Alternatives 2, 3, and 4, impacts are presented in terms of incremental changes from the baseline.

Alternative 1 (Repair As Needed)

Alternative 1 maintains the current status quo in Road repair operations and represents the baseline in terms of the visitor experience and future visitation levels.

Baseline Visitation Projections. Factors ranging from national economic conditions to local forest fires may influence Park visitation levels. As such factors are highly uncertain, predicting future Park visitation levels is difficult. Dr. Thomas Obremski, a statistician with the University of Denver, developed 2-year forecasts for all national parks, based on historic visitation levels. However, long-term visitation forecasts were required to assess future visitation impacts for the duration of all Road construction alternatives. To develop visitation forecasts through the year 2020 for this analysis, Dr. Obremski used an autoregressive statistical model in which annual visitation in a given year is best predicted by previous year visitation levels (WIS 2001b).

Table 31 presents forecasts for both the annual number of visitors and the annual number of parties (those arriving in a single vehicle) taking trips to the Park. Totals for the year 2000 represent actual NPS visitation counts and estimates for the number of

parties. Visitation totals for later years are forecasted estimates from Dr. Obremski's model. Party totals are assumed to grow at the same rate as visitation totals.

Table 31. Alternative 1 (baseline) projections of GNP visitation.

Year	Number of Visitors	Number of Parties
2000	1,729,000	282,000
2001	1,791,000	292,000
2002	1,826,000	297,000
2003	1,845,000	301,000
2004	1,855,000	302,000
2005	1,861,000	303,000
2006-2020 (Annual)	1,868,000	304,000

Source: WIS 2001b; BBC 2002.

From 2001 through 2006, visitation is projected to grow only slightly, at an average annual rate of 0.6 percent, increasing from 1.79 million to 1.87 million visitors. From 2006 through 2020 and beyond, Park visitation is forecast to remain constant. The total number of visitor parties is projected to grow from 292,000 in 2001 to 304,000 in 2006 before leveling off for the remainder of the projection period.

Geographic Distribution of Baseline Visitor Expenditure Projections. Assuming current visitation trends continue over the 50-year Road rehabilitation period, visitor expenditures are forecast to total nearly $72 million in direct and secondary expenditures annually in Flathead County, nearly $41 million in Glacier County, just over $13 million in Lake County, and over $29 million in southwest Alberta. These annual projection totals translate to a cumulative total in direct and secondary visitor spending of $3.6 billion in Flathead County, $1.7 billion in Glacier County, over $660 million in Lake County, and $1.5 billion for Census District 3 in southwest Alberta. Direct and secondary visitor spending for the State of Montana is projected to be about $136 million annually. Over the next 50 years this translates to a cumulative total of direct visitor expenditures in the State of Montana as a whole of nearly $7 billion. Alternative 1 visitor expenditures are included in Table B-9 of Appendix B.

Annual visitor expenditures within each geographic region are assumed to grow proportionately to overall visitation projections. Because the visitation growth rate is slow, annual output projections change very little over the 50-year time horizon. Similarly, annual visitor expenditures are assumed to be distributed geographically according to current travel patterns.

Geographic Distribution of Baseline Jobs. Baseline visitor spending is estimated to support an estimated annual total of just over 1,500 direct and secondary jobs in Flathead County, just over 800 jobs in Glacier County, roughly 300 supporting jobs in Lake County and nearly 600 supporting jobs in southwest Alberta. For the State of Montana as a whole, the number of annual direct and secondary jobs supported by baseline visitor expenditures for the Park is just over 2,900. A table of jobs supported by visitor expenditures is included in Appendix B, Table B-10.

Projected Impacts on Visitation, Expenditures, and Employment. Because Alternative 1 continues current Road rehabilitation efforts and has little or no predictable effect on the visitor experience, no visitor days are projected to be lost due to trip cancellation or trip length reduction. Alternative 1 also does not include any plans to upgrade visitor services. Although Alternative 1 represents a continuation of current Road maintenance and repair activity and is treated as the socioeconomic baseline,

it is possible that in the absence of proactive rehabilitation of the Road, it will suffer one or more catastrophic failures during the 50-year period of this alternative. If a segment of the Road should fail, access to Logan Pass (and passage across the Park) could be cut off altogether from at least one direction for an indeterminate period of time. In such an event, impacts on visitation could be larger than the estimated effects under any of the other alternatives.

Alternative 2 (Priority Rehabilitation)

While the Alpine segment of the Road is the most challenging and costly to rehabilitate, it also contains half of the 14 designated points of interest along the Road. Impacts on visitor experience and visitor use for rehabilitation of the Alpine segment are substantial (comparable to those described under Alternative 3 in the next section), while impacts for rehabilitation of the rest of the Road are assumed to be negligible. Minimal upgrade to visitor use facilities and no visitor development strategies would be implemented to reduce impacts. Potential impacts on the number of visitors and the quality of the visitor experience are possible from construction delays.

Projected Impacts on Visitation, Expenditures, and Employment. Table 32 presents projections of visitation reductions, visitor expenditure reductions, and the number of direct and secondary jobs roughly supported by these expenditure levels for the study area over the 20-year duration of the Road rehabilitation. Under Alternative 2, the number of visitor days lost due to trip cancellation or trip length reduction was estimated at roughly 5 percent. The largest reductions come from local day visitors and non-local day visitors, who are projected to reduce visitor days by 11 percent and 9 percent, respectively (BBC 2002). This result is not surprising because these two groups likely have the most ability to reschedule their trips so as not to conflict with Road rehabilitation. This translates to a reduction in visitor days of roughly 87,000 visitors in 2004, the first year in which Alternative 2 is assumed to be implemented. Under Alternative 2, no visitor service mitigation efforts are planned to offset these negative visitation impacts.

Alternative 2 would have the smallest effect on the visitor experience, annual reduction in visitors, visitor expenditures, and jobs supported compared to Alternatives 3 and 4. Under this alternative, annual visitor days are projected to fall by just over 87,000, while annual expenditure levels are projected to fall by $5.1 million relative to Alternative 1. The number of annual direct and secondary jobs corresponding to these changes in expenditures totals 115 and 40, respectively. These annual totals represent a decline of roughly 5.5 percent in annual visitor expenditure levels and a decline of roughly 6.1 percent of annual supporting jobs for the Montana study area compared to Alternative 1.

Estimated impacts, measured in terms of reductions in visitation, visitor expenditures, and supporting jobs are projected to grow in proportion to overall baseline visitation projections over the 20-year projection period. As shown in Table 33, overall visitation is projected to grow slowly enough so that all three measures remain almost constant over the 20-year life of Alternative 2. Note that all impacts under this alternative are anticipated to end in or shortly after year 2024, once Road rehabilitation has been completed.

Geographic Distribution of Visitor Expenditure Impacts. As shown in Table 32, Alternative 2 is projected to result in an estimated annual loss of about $3.1 million in direct and secondary expenditures in Flathead County, $1.8 million in Glacier County, $0.6 million in Lake County and $2.2 million in southwest Alberta. Over the 20-year construction period, this translates to a reduction in direct and secondary visitor spending of $62 million in Flathead County, $35 million in Glacier County, $11 million in Lake County and $45 million for Census District 3 in southwest Alberta.

Direct visitor spending for the State of Montana is reduced by over $4 million annually. Over the life

Table 32. Projected study area effects on Park visitation, annual expenditures, and tourism-related employment for Alternative 2.

Year	Visitors†	Direct Annual Expenditures (2000 Dollars)‡	Jobs‡		
			Direct	Secondary	Total
2004	-86,750	$5,174,000	-110	-35	-145
2005	-87,030	$5,171,000	-110	-35	-145
2006	-87,170	$5,199,000	-110	-35	-145
2007	-87,260	$5,204,000	-110	-35	-145
2008	-87,310	$5,207,000	-110	-35	-145
2009 – 2023 (Annual Impacts)	-87,350	$5,210,000	-110	-35	-145

†Visitor impact projections assume a constant average party size of 2.83 and an average length of stay in the area of 3.3 nights.

‡The calculated direct effect expenditure and job totals in this table have been updated to 2001 levels using IMPLAN deflators derived from the most recent Bureau of Labor Statistics Growth Model.

Source: BBC 2002.

Table 33. Projected annual effects on visitor expenditures for Alternative 2 (millions of year 2001 dollars).

Year	State of Montana		Flathead County		Glacier County		Lake County		SW Alberta (CD-3)	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004-2011†	-$4.279	-$5.876	-$2.315	-$3.098	-$1.503	-$1.759	-$0.443	-$0.571	-$0.913	-$2.235
2012-2023 (Annual Impacts)	-$4.309	-$5.917	-$2.332	-$3.120	-$1.513	-$1.772	-$0.446	-$0.575	-$0.919	-$2.250
Total	-$86.119	-$118.256	-$46.604	-$62.354	-$30.238	-$35.413	-$8.915	-$11.493	-$18.368	-$44.969

†Annual values for 2004 to 2011 are similar. Appendix B includes details for all years.

Source: BBC 2002.

of the construction project, this translates to a decline in direct visitor expenditures in the State of Montana as a whole of $86 million, almost all of which occurs in the Montana portion of the local impact area. About 8 percent of the $118 million reduction in total (both direct and secondary) visitor spending for the State of Montana occurs outside the Montana portion of local impact area. Appendix B includes additional detail on annual impacts by geographic area (Tables B-11 and B-12 in Appendix B).

The reduction in visitor expenditures within each geographic region is also assumed to grow proportionately to overall visitation projections. Because this growth rate is slow, the decline in output sales changes very little over the 20-year construction period. For Flathead, Glacier, and Lake counties and Census District 3, projected annual expenditure reductions represent roughly a 4.7 percent decrease from Alternative 1.

Similarly, the reduction in visitor expenditures is assumed to follow the same geographic distribution as overall visitor expenditures. This distribution depends on the proportion of visitor types (day trippers, motel customers, campers, etc.) that each area attracts. Different types of visitors spend different amounts of money each day on different items. The dollar volume of impact differs, depending on the size and diversity of the local economy and its ability to attract visitors. For example, a significant share of motel customers pass through Glacier County because both East Glacier Lodge and Many Glacier Lodge are accessed from the east side of the Park.

Geographic Distribution of Job Impacts

Alternative 2 triggers an estimated annual loss of 65 direct and secondary supporting jobs in Flathead County, 35 jobs in Glacier County, 15 jobs in Lake County and 30 jobs in southwest Alberta. For the State of Montana as a whole, an annual reduction of 125 direct and secondary jobs is projected. See Appendix B for a table of impacts on jobs by geographic location.

Alternative 3—Preferred (Shared Use)

The primary impacts on the visitor experience and visitation levels from Road rehabilitation under this alternative will result from the additional delays during the peak season and the restricted Road access during the shoulder season. Negative visitor impacts resulting from these delays will be offset to some degree by the additional visitor services. Delays and access restrictions should be similar on all Road segments, although the Alpine segment will take longer to rehabilitate due to logistical challenges.

Projected Impacts on Visitation, Expenditures, and Employment. Table 34 presents projections of visitation reductions, visitor expenditure reductions, and the number of direct and secondary jobs roughly supported by these expenditure levels over the projected 8-year life of the rehabilitation project. Under Alternative 3, the number of visitor days lost due to trip cancellation or trip length reduction was estimated at over 15 percent. The largest reductions come from local day visitors and non-local day visitors, who are projected to reduce visitor days by 33 percent and 27 percent respectively. Impacts on visitor experience and the number of visitor days projected to be lost under Alternative 3 would be partly offset by mitigation measures to upgrade visitor services within the Park. With visitor service mitigation measures implemented, the loss of visitor days resulting from Road rehabilitation were estimated at about 7 percent or about 130,000 visitor days.

Table 34. Projected study area effects on Park visitation, annual expenditures, and tourism-related employment for Alternative 3.

Year	Visitors†	Direct Annual Expenditures (2000 Dollars)‡	Jobs‡		
			Direct	Secondary	Total
2004	-131,780	$7,998,000	-165	-60	-225
2005	-132,210	$8,025,000	-165	-60	-225
2006	-132,420	$8,037,000	-165	-60	-225
2007	-132,560	$8,045,000	-165	-60	-225
2008	-132,640	$8,050,000	-165	-60	-225
2009 – 2011 (Annual Impacts)	-132,710	$8,050,000	-165	-60	-225

†Visitor impact projections assume a constant average party size of 2.83 and an average length of stay in the area of 3.3 nights.

‡The calculated direct effect expenditure and job totals in this table have been updated to 2001 levels using IMPLAN deflators derived from the most recent Bureau of Labor Statistics Growth Model.

Source: BBC 2002.

Compared to Alternative 2, Alternative 3 has a larger annual reduction but a smaller cumulative reduction in visitors, visitor expenditures, and jobs supported. Under Alternative 3, annual visitor days are projected to fall by more than 130,000, while annual direct expenditure levels in the study area are projected to fall by nearly $8 million (Table 34) with about 45 percent of the impact occurring in Flathead County (Table 35). The number of annual direct and secondary jobs corresponding to these changes in expenditures totals 165 and 60, respectively (Table 34). These totals represent a decline of roughly 8.6 percent in annual visitor expenditure levels and a decline of roughly 9.4 percent of annual supporting jobs for the Montana study area. All impacts under this alternative are assumed to end in or shortly after year 2011 once Road rehabilitation has been completed.

Geographic Distribution of Visitor Expenditure Impacts. With mitigation, Alternative 3 is projected to result in an estimated annual loss of $4.8 million in direct and secondary expenditures in Flathead County, $2.7 million in Glacier County, $0.9 million in Lake County and $3.5 million in southwest Alberta (Table 35). Over the 8-year construction period, this translates to a reduction in direct and secondary visitor spending of $38 million in Flathead County, $22 million in Glacier County, $7 million in Lake County, and $28 million for Census District 3 in southwest Alberta. Direct visitor spending for the State of Montana is reduced by over $6.6 million annually. Over the life of the construction project, this translates to a decline in direct visitor expenditures in the State of Montana as a whole of $53 million.

For Flathead, Glacier, and Lake counties and Census District 3, projected annual expenditure reductions represent a 7.2 percent decrease from baseline conditions in Alternative 1. Tables B-13 and B-14

Table 35. Projected annual effects on visitor expenditures for Alternative 3 (millions of year 2001 dollars).

	State of Montana		Flathead County		Glacier County		Lake County		SW Alberta (CD-3)	
Year	**Direct**	**Total**	**Direct**	**Total**	**Direct**	**Total**	**Direct**	**Total**	**Direct**	**Total**
2004-2011[†]	-$6.614	-$9.086	-$3.579	-$4.790	-$2.323	-$2.721	-$0.685	-$0.884	-$1.411	-$3.451
Total	-$53.185	-$73.067	-$28.779	-$38.522	-$18.680	-$21.880	-$5.511	-$7.108	-$11.347	-$27.755

[†]Annual values for 2004 to 2011 are similar. Appendix B includes details for all years.

Source: BBC 2002.

in Appendix B include additional detail on annual impacts by geographic area.

Geographic Distribution of Job Impacts. Implementation of Alternative 3 results in an estimated annual loss of 100 direct and secondary supporting jobs in Flathead County, 55 jobs in Glacier County, 20 jobs in Lake County and 50 jobs in southwest Alberta. An annual reduction of 195 direct and secondary jobs is projected for the State of Montana as a whole. Appendix B includes a table of impacts on jobs by geographic location.

Alternative 4 (Accelerated Completion)

Alternative 4 is the most aggressive alternative under consideration, and attempts to complete rehabilitation of the Road as quickly as possible. This alternative is the most efficient from a construction standpoint. Complete rehabilitation of the Road is projected to take 7 years.

While this alternative maximizes construction efficiency, it also has the largest impacts on the visitor experience and visitor use. This alternative goes further than Alternative 3 in that traffic suspensions on individual Road segments occur throughout both the peak and shoulder visitation seasons. Since the Road remains the preeminent attraction within Park boundaries, traffic suspensions have the greatest potential for prompting a loss of visitor days.

Projected Impacts on Visitation, Expenditures, and Employment. Under Alternative 4, the number of visitor days lost due to trip cancellation or trip length reduction was estimated to be almost 29 percent. The largest reductions come from local day visitors and non-local day visitors, who are projected to reduce visitor days by 46 percent and 54 percent, respectively. As under Alternative 3, impacts on the visitor experience and visitor use resulting from these delays would be offset to some degree by the improved visitor services provided as mitigation. The loss of visitor days resulting from Road rehabilitation was estimated at about 15 percent with visitor service mitigation measures implemented. This translates to an annual visitor loss of roughly 280,000 visitors assuming implementation of the visitor service mitigation measures.

Table 36 presents projections of visitation reductions, visitor expenditure reductions and the number of direct and secondary jobs roughly supported by these expenditure levels for the study area over the projected 7-year life of the rehabilitation project.

Table 36 Projected study area effects on Park visitation, annual expenditures, and tourism-related employment for Alternative 4.

Year	Visitors†	Direct Annual Expenditures (2000 Dollars)‡	Jobs‡		
			Direct	Secondary	Total
2004	-279,855	$17,285	-370	-120	-490
2005	-280,759	$17,640	-370	-120	-490
2006	-281,208	$17,368	-370	-120	-490
2007	-281,512	$17,386	-370	-120	-490
2008	-281,664	$17,396	-370	-120	-490
2009	-281,816	$17,406	-370	-120	-490
2010	-281,816	$17,406	-370	-120	-490

†Visitor impact projections assume a constant average party size of 2.83 and an average length of stay in the area of 3.3 nights.

‡The calculated direct effect expenditure and job totals in this table have been updated to 2001 levels using IMPLAN deflators derived from the most recent Bureau of Labor Statistics Growth Model.

Source: BBC 2002.

Compared to Alternatives 2 and 3, Alternative 4 has a greater impact on the visitor experience and larger reductions in visitors, visitor expenditures, and jobs supported relative to the baseline. Under this alternative, annual visitors are projected to fall by about 280,000, while annual expenditure levels are projected to fall by nearly $18 million. The number of annual direct and secondary jobs corresponding to these changes in expenditures totals 370 and 120, respectively. These annual totals represent a decline of roughly 19 percent in annual visitor expenditure levels and a decline of roughly 21 percent of annual supporting jobs for the Montana study area relative to the baseline in Alternative 1. Note that all impacts under this alternative are assumed to end in or shortly after year 2010, once Road rehabilitation has been completed.

Geographic Distribution of Visitor Expenditure Impacts. Alternative 4 is projected to result in an estimated annual loss of $10.4 million in direct and secondary output in Flathead County, $5.9 million in Glacier County, $1.9 million in Lake County, and $7.5 million in southwest Alberta (Table 37). Over the 7-year construction period, this translates to a reduction in direct and secondary output of $73 million in Flathead County, $41 million in Glacier County, $13 million in Lake County, and $53 million for Census District 3 in southwest Alberta.

Direct visitor spending for the State of Montana is reduced by over $14.3 million annually. Over the life of the construction project, this translates to a decline in direct visitor expenditures in the State of Montana as a whole of $101 million, and a nearly $138 million reduction in total (both direct and secondary) output across the state. For Flathead, Glacier, and Lake counties and Census District 3, projected annual expenditure reductions represent a 15.7 percent decrease from the baseline.

Geographic Distribution of Job Impacts. Implementation of Alternative 4 results in an estimated annual loss of 220 direct and secondary supporting jobs in Flathead County, 120 supporting jobs in Glacier County, 40 supporting jobs in Lake County, and 110 supporting jobs in southwest

Table 37. Projected annual effects on visitor expenditures for Alternative 4 (thousands of year 2001 dollars).

Year	State of Montana		Flathead County		Glacier County		Lake County		SW Alberta (CD-3)	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004-2010†	-$14,295	-$19,632	-$7,735	-$10,351	-$5,020	-$5,878	-$1,480	-$1,909	-$3,050	-$7,464
Total	-$100,559	-$138,099	-$54,407	-$72,814	-$35,310	-$41,347	-$10,414	-$13,430	-$21,453	-$52,504

Alberta. An annual reduction of 425 direct and secondary jobs is projected for the State of Montana as a whole. Tables B-15 and B-16 in Appendix B show effects on jobs by geographic location.

Summary of Overall Visitation Impacts

Table 38 summarizes, by alternative, projected changes in number of visitors, total visitation related expenditures and total visitation related employment. Annual visitation reductions from the baseline range from nearly 90,000 under Alternative 2 to 280,000 under Alternative 4. Reductions in visitation related expenditures and employment range from around 5 percent under Alternative 2 to nearly 15 percent under Alternative 4.

Projected Economic Impacts From Construction Activity

In contrast to current repair as needed practices for the Road (which are embodied in Alternative 1), the other alternatives would involve substantial increases in construction activity. Alternative 2 would approximately triple current annual Road repair expenditures over a 20-year period, while Alternatives 3 and 4 would increase average annual expenditures to more than 5 times current levels for a 7- to 8-year period.

These increases in construction expenditures would be used to hire labor, purchase materials, and rent or purchase equipment, as well as for design and engineering services. Much of the labor may be hired from within the study area workforce, while some specialized workers may be brought in from

Table 38. Summary of average annual visitation-related effects.

Average Annual Effects†	Number of Visitors	Total Visitation Related Expenditures‡ (2001 dollars)	Total Visitation Related Employment‡
Alternative 1 (Baseline)	1,867,500	$118,336,000	3,235
Alternative 2	-87,300	-$5,137,000	-160
Alternative 3	-132,500	-$7,931,000	-245
Alternative 4	-280,000	-$17,137,000	-581

†Duration of effects varies by alternative. Baseline period is 50 years; Alternative 1 is 50 years; Alternative 2 is 20 years; Alternative 3 is 8 years; Alternative 4 is 7 years. Effects of each alternative are incremental to the baseline.

‡Visitation related expenditures and employment includes secondary (indirect and induced) economic effects.

other areas. Local hiring, temporary location of non-local workers, and any local purchases of supplies, equipment or services all have socioeconomic implications for the study area.

The following section summarizes the direct and secondary construction impacts associated with each rehabilitation alternative. For Alternative 1, baseline projections of construction expenditures, labor cost per employee, and the local job base supported by these expenditures are presented. The negligible incremental impacts associated with Alternative 1 are then briefly discussed. For Alternatives 2, 3, and 4, the incremental impacts from this baseline are presented, expressed both in changes in regional output (sales) and corresponding changes in regional employment levels.

Alternative 1 (Repair as Needed)

The Park's Road construction budget would be maintained at an annual level of $1 million to $2 million, and total rehabilitation of the Road over 50 years is projected to cost between $98 and $117 million in constant 2001 dollars. The Park's current operations and maintenance budget for the Road would be continued at $560,000 annually. This alternative would involve no increase in the Park's construction budget. With no provisions for an upgrade of the Park's operation and maintenance budget, no effort would be made to protect Road rehabilitation investments that did occur during the 50-year construction period.

Baseline Construction Expenditure Projections. Table 39 provides projections of baseline construction related expenditures. Expenditures are further separated into annual expenditures on design and engineering, construction equipment, construction materials, additional operations and maintenance, and labor, all expressed in terms of 2001 dollars. Finally, the table depicts labor cost per construction employee and the number of local and non-local construction jobs supported by this activity.

Annual expenditure totals of $323,000 for design and engineering, $543,000 for equipment, $611,000 for materials and $673,000 for labor are projected under this alternative. Since no funds are provided for upgrading the Park's operations and maintenance budget, no additional operations and maintenance expenditures are projected. The expenditure totals do not vary across years, because the Park's annual construction budget is projected to remain constant over the 50-year construction period under this alternative. Across the 50-year construction time horizon, annual expenditure totals translate to cumulative expenditures of just over $16 million for design and engineering, just over $27 million for equipment, nearly $31 million for materials, and nearly $34 million for labor.

Annual average labor costs per employee are projected at $24,000. The total number of annual

Table 39. Projected Alternative 1 (baseline) annual construction activity by category (2001 dollars).

Year	Expenditures					Labor Cost/ Employee	Direct Jobs‡	
	Design/ Engineering	Equipment	Materials	O&M Upgrade†	Labor		Local	Non-Local
2004 - 2053	$323,000	$543,000	$611,000	$0	$673,000	$24,000	15	15
Total	$16,150,000	$27,150,000	$30,550,000	$0	$33,650,000	$1,200,000	—	—

†O&M upgrade includes spending for labor, equipment, and materials.

‡Jobs are head count during construction season, not full-time equivalents.

Source: BBC 2002.

construction related jobs is projected to be 30. These jobs are estimated to be split equally between the Montana portions of the local impact area and other Montana counties.

Geographic Distribution of Baseline Construction Expenditures. Table 40 describes the geographic distribution of the direct and secondary impacts of estimated baseline construction expenditures for each of the Montana counties in the local impact area and for the State of Montana as a whole. Over the next 50 years, direct and secondary economic output resulting from construction expenditures is projected to total over $1.3 million annually in Flathead County, nearly $0.7 million in Glacier County, and just over $30,000 in Lake County. Note that no construction impact is projected for Census District 3 in southwest Alberta as it is anticipated that all construction firms and workers will come from the United States. Over the next 50 years, these annual projection totals translate to a cumulative total in direct and secondary construction related economic output of roughly $65 million in Flathead County, $35 million in Glacier County, and $1.6 million in Lake County.

Direct and secondary construction related economic output for the State of Montana is projected to be about $2.2 million annually. This translates to a cumulative total of direct and secondary construction related economic output in the State of Montana as a whole of just over $110 million.

Projected Construction Impacts. Because Alternative 1 assumes that Road rehabilitation operations within the Park would remain unchanged relative to the existing baseline, no additional expenditures or economic impacts are projected for any of the Montana counties in the local impact area, Census District 3 in Alberta, or for the State of Montana as a whole under this alternative.

Alternative 2 (Priority Rehabilitation)

The annual Road construction budget would be about $5 million for Alternative 2. Total rehabilitation of the Road is projected to cost between $91 and $108 million in constant 2001 dollars and the annual operations and maintenance budget would increase to $1.5 to $1.9 million.

Construction Expenditure Projections. Table 41 provides detailed annual projections of expenditures on design and engineering, construction equipment, construction materials, additional operations and maintenance, and labor, all expressed in terms of 2001 dollars. The table also includes projections of labor cost per construction employee and the number of local and non-local construction jobs supported under Alternative 2. Note that the increase in jobs is less than the increase in overall construction expenditures. This is because a significant portion of the expenditure increases is targeted for non-labor inputs such as equipment, materials, and design/engineering.

Table 40. Projected baseline annual effects on construction expenditures for Alternative 1 (2001 dollars).

Year	State of Montana		Flathead County		Glacier County		Lake County	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004-2053	$1,563,000	$2,213,000	$942,000	$1,311,000	$591,000	$699,000	$27,000	$32,000
Total	$78,150,000	$110,650,000	$47,100,000	$65,550,000	$29,550,000	$34,950,000	$1,350,000	$1,600,000

Source: BBC 2002.

Table 41. Projected construction expenditure for Alternative 2 (2001 dollars).

Annual Expenditures	Expenditures					Labor Cost/Employee	Direct Jobs‡	
	Design/ Engineering	Equipment	Materials	O&M Upgrade†	Labor		Local	Non Local
2004-2020	$2,020,000	$863,000	$972,000	$1,140,000	$1,070,000	$24,000	20	20
Total	$40,400,000	$17,260,000	$19,440,000	$22,800,000	$21,400,000	$480,000	—	—

†O&M upgrade includes spending for labor, equipment, and materials.

‡Jobs are head count during construction season, not full-time equivalents.

Source: BBC 2002.

Annual expenditure totals of $2 million for design and engineering, $863,000 for equipment, $972,000 for materials, and $1.07 million for labor are projected under this alternative. The additional funds allocated for upgrading the Park's operations and maintenance budget under this alternative are added to the expenditure projections. As under Alternative 1, the expenditure totals do not vary across years, because the Park's annual construction budget is projected to remain constant over the 20-year construction period under this alternative. Across this construction time horizon, annual expenditure totals translate to cumulative expenditures of just over $40 million for design and engineering, just over $17 million for equipment, nearly $20 million for materials, nearly $23 million for operations and maintenance, and over $21 million for labor.

Annual average labor costs per employee are projected at $24,000, based on an 18-week construction season. The total number of annual construction related jobs is projected to be 40. These jobs are anticipated to be split equally between the Montana portions of the local impact area and other Montana counties.

Geographic Distribution of Construction Expenditure Impacts. Table 42 describes the geographic distribution of the direct and secondary impacts of estimated construction expenditures, over and above the baseline, for each of the Montana counties in the local impact area and for the State of Montana as a whole. Additional direct and secondary economic output due to construction expenditures is projected to total over $1.8 million annually in Flathead County, nearly $0.9 million in Glacier County, and $20,000 in Lake County. Over the 20-year projected construction period for this alternative, annual projection totals translate to a cumulative total of additional direct and secondary construction related spending of roughly $36 million in Flathead County, $17 million in Glacier County, and $400,000 in Lake County.

Table 42. Projected effects on construction expenditures for Alternative 2 (2001 dollars).

Annual Expenditures	State of Montana		Flathead County		Glacier County		Lake County	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004-2023	$2,092,000	$2,820,000	$1,337,000	$1,831,000	$737,000	$870,000	$16,000	$20,000
Total	$41,480,000	$56,400,000	$26,740,000	$36,620,000	$14,740,000	$17,400,000	$320,000	$400,000

Source: BBC 2002.

Direct and secondary construction related economic output for the State of Montana as a whole is projected to be about $2.8 million annually for Alternative 2. This translates to a cumulative total in the State of Montana, including the three study area counties, of just over $56 million over the 20-year rehabilitation period.

The impacts on construction employment and purchasing within the study area can also be examined in terms of numbers of jobs. On average, annual rehabilitation activity under Alternative 2 is estimated to directly support about 20 construction jobs, including approximately 10 jobs in Flathead County and 5 jobs in Glacier County. Secondary economic effects resulting from Alternative 2 would support an additional 10 jobs divided between Flathead County and Glacier County.

Alternative 3—Preferred (Shared Use)

The Park's Road construction budget would increase to $10 to $23 million annually for Alternative 3. Total rehabilitation of the Road is projected to cost between $97 and $124 million in constant 2001 dollars. The Park's operations and maintenance budget would increase to $1.5 to $1.9 million annually.

Construction Expenditure Projections. Table 43 provides detailed annual projections of expenditures on design and engineering, construction equipment, construction materials, additional operations and maintenance, and labor, all expressed in terms of 2001 dollars. The table also includes projections of labor cost per construction employee and the number of local and non-local construction jobs supported under Alternative 3.

Projections of annual construction expenditures under Alternative 3 differ markedly from the projections developed for Alternatives 1 and 2 in that they vary significantly across the 8-year construction period, peaking during the second and third years before declining to a constant level in years four through eight. Annual expenditures for design and engineering peak at nearly $5.3 million before leveling off to $4.7 million while equipment expenditures peak at nearly $3.5 million before leveling off to $1.5 million. Similarly, annual materials expenditures range from $3.9 million to $1.7 million, and labor expenditures range from $4.3

Table 43. Projected construction expenditures for Alternative 3 (2001 dollars).

Year	Expenditures					Labor Cost/ Employee	Direct Jobs‡	
	Design/ Engineering	Equipment	Materials	O&M Upgrade†	Labor		Local	Non-Local
2004	$4,913,000	$2,269,000	$2,557,000	$1,140,000	$2,815,000	$28,000	50	50
2005	$5,312,000	$3,454,000	$3,891,000	$1,140,000	$4,285,000	$28,000	75	75
2006	$5,267,000	$3,321,000	$3,741,000	$1,140,000	$4,119,000	$28,000	75	75
2007 – 2011*	$4,654,000	$1,502,000	$1,692,000	$1,140,000	$1,863,000	$28,000	35	35
Total	$38,762,000	$16,554,000	$18,649,000	$9,120,000	$20,534,000	$224,000	—	—

†O&M upgrade includes spending for labor, equipment and materials.

‡Jobs are head count during construction season, not full-time equivalents.

*Annual values for 2007 to 2011 are similar.

Source: BBC 2002.

million to $1.9 million. The additional funds allocated for upgrading the Park's operations and maintenance budget under this alternative are added to the expenditure projections. Across the 8-year construction time horizon, annual expenditure totals translate to cumulative expenditures of just over $38.8 million for design and engineering, over $16 million for equipment, nearly $19 million for materials, over $9 million for operations and maintenance, and nearly $21 million for labor.

Annual average labor costs per employee are projected at $28,000. The additional cost per worker as compared to that used for Alternatives 1 and 2 is due to the assumption that construction workers would work a 21-week season as opposed to an 18-week season under the other alternatives because a significant portion of the work would be completed during the spring and fall shoulder seasons. The total number of annual construction related jobs ranges from 150 during peak years before leveling off to around 70. These jobs are anticipated to be split equally between the Montana portions of the local impact area and other Montana counties.

Geographic Distribution of Construction Expenditure Impacts. Table 44 describes the geographic distribution of the direct and secondary impacts to the local study area of estimated construction expenditures, over and above the current baseline expenditures, for each of the Montana counties in the local impact area and for the State of Montana as a whole. Over the 8-year construction period, additional direct and secondary economic output due to construction expenditures is projected to range from $8.1 to $3.4 million annually in Flathead County, from $4.2 million to nearly $1.7 million in Glacier County, and from $174,000 to $58,000 in Lake County. Over the 8-year projected construction period for this alternative, these annual totals translate to a cumulative total of additional direct and secondary output due to construction related spending of roughly $38 million in Flathead County, $19 million in Glacier County, and $700,000 in Lake County.

Direct and secondary output due to construction related spending for the State of Montana is projected to range from $13.4 to $5.4 million annually for Alternative 3. Over the 8-year construction period, this translates to a cumulative total in the State of Montana, including the three study area counties, of nearly $62 million.

The impacts on construction employment and purchasing within the study area can also be examined in terms of numbers of jobs. On average, annual rehabilitation activity under Alternative 3 is estimated to directly support about 50 construction jobs in the State of Montana, including approximately 30 jobs in Flathead County and 20 jobs in Glacier County. The peak impacts would

Table 44. Projected effects on construction expenditures for Alternative 3 (2001 dollars).

Year	State of Montana		Flathead County		Glacier County		Lake County	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004	$6,143,000	$8,555,000	$3,778,000	$5,228,000	$2,269,000	$2,682,000	$87,000	$103,000
2005	$9,554,000	$13,385,000	$5,834,000	$8,089,000	$3,559,000	$4,208,000	$146,000	$174,000
2006	$9,170,000	$12,841,000	$5,603,000	$7,767,000	$3,414,000	$4,036,000	$139,000	$166,000
2007 – 2011*	$3,933,000	$5,426,000	$2,446,000	$3,374,000	$1,433,000	$1,693,000	$48,000	$58,000
Total	$44,532,000	$61,911,000	$27,445,000	$37,954,000	$16,407,000	$19,391,000	$612,000	$733,000

*Annual values for 2007 to 2011 are similar.

Source: BBC 2002.

occur during the second and third years of construction, when about 45 construction jobs in Flathead County and 30 construction jobs in Glacier County would be supported by this alternative.

Including secondary economic effects, Alternative 3 would support an average of approximately 90 jobs across the state, including nearly 50 jobs in Flathead County and about 30 jobs in Glacier County. During the second and third years of this alternative, total employment impacts would peak at about 85 jobs supported in Flathead County and about 40 jobs supported in Glacier County.

Alternative 4 (Accelerated Completion)

The Park's Road construction budget would increase to $9 to $20 million annually for Alternative 4. Total rehabilitation of the Road is projected to cost between $91 and $103 million in constant 2001 dollars. The Park's operations and maintenance budget would be $1.5 to $1.9 million annually.

Construction Expenditure Projections. Table 45 provides detailed annual projections of expenditures on design and engineering, construction equipment, construction materials, additional operations and maintenance, and labor, all expressed in terms of 2001 dollars. The table also includes projections of labor cost per construction employee and the number of local and non-local construction jobs available under Alternative 4.

Projections of annual construction expenditures under Alternative 4, like those for Alternative 3, vary significantly across the 7-year construction period. Expenditures peak during the second year before declining to a constant level in years five through seven. Annual expenditures for design and engineering peak at nearly $5 million before leveling off to $4.4 million while equipment expenditures peak at nearly $3.1 million before leveling off to $1.2 million. Similarly, annual materials expenditures range from nearly $3.6 million to $1.4 million, and labor expenditures range from $3.7 million to nearly $1.5 million. The additional funds allocated for upgrading the Park's operations and maintenance budget under this alternative are added to the expenditure projections. Across the 7-year construction time horizon, annual expenditure totals translate to cumulative expenditures of just over

Table 45. Projected expenditures for Alternative 4 (2001 dollars).

Year	Expenditures					Labor Cost/ Employee	Direct Jobs‡	
	Design Engineering	Equipment	Materials	O&M Upgrade†	Labor		Local	Non Local
2004	$4,784,000	$2,485,000	$2,837,000	$1,140,000	$2,974,000	$24,000	60	60
2005	$4,997,000	$3,123,000	$3,566,000	$1,140,000	$3,738,000	$24,000	75	75
2006	$4,784,000	$2,485,000	$2,837,000	$1,140,000	$2,974,000	$24,000	60	60
2007	$4,583,000	$1,881,000	$2,147,000	$1,140,000	$2,251,000	$24,000	45	45
2008 – 2010*	$4,370,000	$1,242,000	$1,419,000	$1,140,000	$1,487,000	$24,000	30	30
Total	$32,258,000	$13,701,000	$15,644,000	$7,980,000	$16,398,000	$168,000	—	—

†O&M upgrade includes spending for labor, equipment and materials.

‡Jobs are head count during construction season, not full-time equivalents.

*Annual values for 2008 to 2010 are similar.

Source: BBC 2002.

$32.2 million for design and engineering, nearly $14 million for equipment, nearly $16 million for materials, nearly $8 million for operations and maintenance, and over $16 million for labor.

Annual average labor costs per employee are projected at $24,000. The total number of annual construction related jobs ranges from 150 during peak years before leveling off to around 60. These jobs are assumed to be split equally between the Montana portions of the local impact area and other Montana counties.

Geographic Distribution of Construction Expenditure Impacts. Table 46 describes the geographic distribution of the direct and secondary impacts of estimated construction expenditures, over and above the baseline, for each of the Montana counties in the local impact area and for the State of Montana as a whole. Over the 7-year construction period, additional direct and secondary economic output due to construction expenditures is projected to range from $7.3 to $2.7 million annually in Flathead County, from nearly $3.8 million to nearly $1.3 million in Glacier County, and from $148,000 to $40,000 in Lake County. Over the 7-year projected construction period for this alternative, these annual totals translate to a cumulative total of additional direct and secondary economic output of roughly $31 million in Flathead County, $16 million in Glacier County, and nearly $600,000 in Lake County.

Direct and secondary construction related output for the State of Montana is projected to range from $12 million to nearly $4.4 million annually for Alternative 4. Over the 7-year construction period, this translates to a cumulative total of economic output in the State of Montana as a whole of nearly $51 million.

The impacts on construction employment and purchasing within the study area can also be examined in terms of numbers of jobs. On average, annual rehabilitation activity under Alternative 4 is estimated to directly support about 50 construction jobs in the State of Montana, including approximately 30 jobs in Flathead County and 20 jobs in Glacier County. The peak impacts would occur during the second year of construction, when about 45 construction jobs in Flathead County and 30 construction jobs in Glacier County would be supported by this alternative.

Including secondary economic effects, Alternative 4 would support an average of approximately 80 jobs

Table 46. Projected construction expenditures for Alternative 4 (2001 dollars).

Year	State of Montana		Flathead County		Glacier County		Lake County	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
2004	$6,735,000	$9,405,000	$4,150,000	$5,750,000	$2,483,000	$2,939,000	$93,000	$111,000
2005	$8,566,000	$12,000,000	$5,257,000	$7,292,000	$3,173,000	$3,755,000	$124,000	$148,000
2006	$6,735,000	$9,405,000	$4,150,000	$5,750,000	$2,483,000	$2,939,000	$93,000	$111,000
2007	$5,003,000	$6,950,000	$3,102,000	$4,291,000	$1,830,000	$2,166,000	$64,000	$76,000
2008 – 2010*	$3,172,000	$4,354,000	$1,995,000	$2,748,000	$1,141,000	$1,349,000	$33,000	$40,000
Total	$36,555,000	$50,822,000	$22,644,000	$31,327,000	$13,392,000	$15,846,000	$473,000	$566,000

*Annual values for 2008 to 2010 are similar.

Source: BBC 2002.

across the state, including nearly 50 jobs in Flathead County and about 30 jobs in Glacier County. During the second year of this alternative, total employment impacts would peak at about 80 jobs supported in Flathead County and about 40 jobs supported in Glacier County.

Summary of Overall Construction Impacts

Table 47 summarizes, by alternative, projected changes in direct construction spending, total construction related regional output, and total construction related employment. Incremental annual construction expenditures to the baseline range from nearly $3.9 million under Alternative 2 to over $10 million for Alternatives 3 and 4. Incremental increases to the baseline in construction-related expenditures range from $2.7 million under Alternative 2 to $6.8 million under Alternative 4. Annual employment increases range from 10 jobs under Alternative 2 to 65 jobs under Alternatives 3 and 4.

Projected Impacts on Park Operations

Changes in Park Operations

With annual baseline funding of about $10 million, additional special projects funding of nearly $20 million, and about 130 full time and up to 390 part time workers on staff, NPS operations at GNP also contribute to the economy in the study area. Park revenues and operations are expected to experience a variety of impacts under the alternatives. Some of these impacts tend to offset one another.

Park Revenues. While entrance fees could be impacted by changes in visitation under the alternatives, such impacts are expected to be negligible in the context of overall Park revenuess. Although 80 percent of entrance fees and concession franchise fees at GNP are ultimately returned to the Park by the NPS, such fees comprise a very small portion of overall funding. The vast majority of GNP revenues are comprised of special project funds and the annual baseline appropriation. The former (special project funds) would likely increase substantially under the proactive Road rehabilitation alternatives (Babb, pers. comm. 2002).

Table 47. Summary of Average Annual Construction-Related Effects

Average Annual Effects[†]	Direct Construction Spending (2001 dollars)	Total Regional Output[‡] (2001 dollars)	Total Employment[‡]
Alternative 1 (Baseline)	$2,150,000	$2,042,000	30
Alternative 2	$3,915,000	$2,721,000	10
Alternative 3	$10,802,000	$7,260,000	65
Alternative 4	$10,133,000	$6,820,000	65

[†]Duration of effects varies by alternative. Baseline period is 50 years; Alternative 1 is 50 years; Alternative 2 is 20 years; Alternative 3 is 8 years; Alternative 4 is 7 years. Effects of each alternative are incremental to the baseline.

[‡]Construction related expenditures and employment include secondary (indirect and induced) economic effects. A substantial portion of the construction jobs created are expected to be filled by non-local workers.

Park Operations and Employment. Park staffing levels may experience a negligible increase under Alternative 2 and a minor to moderate increase under either Alternative 3 or Alternative 4. If there are fewer visitors, and less revenues from entrance fees, as a result of Road rehabilitation, the Park would be inclined to reduce the number of seasonal positions hired. However, this potential reduction in visitor service staffing is expected to be offset by the need for additional staff to implement the socioeconomic mitigation measures described in Chapter 2. GNP also indicated it anticipates a need for more rangers and an increase in construction related staff under the proactive rehabilitation alternatives (Babb, pers. comm. 2002).

The conversion of Logan Pit to an oversized vehicle turnaround and parking area would result in the long-term loss of the only maintenance site and construction staging area along the Road and would require relocation of these activities to other developed areas in the Park.

Fiscal and Community Impacts

Impacts on Public Revenues and Expenditures

Fiscal impacts are expected to be negligible under any of the four potential alternatives.

Local Government Revenues. From a revenue standpoint, the principal revenue source for local governments in the study area is property taxes. Interviews with local government representatives indicated they did not anticipate any impact on their revenues from changes in visitation or construction activity associated with Road rehabilitation. This perception was reinforced by study team interviews with local governments near Yellowstone National Park and Yosemite National Park. Though these parks had experienced multiple year visitation reductions due to wildfires and Road construction, local government representatives indicated there was no perceptible effect on the local property tax base.

Service Requirements and Costs. Local government representatives also indicated they generally did not expect a change in service requirements or costs under any of the alternatives. The modest magnitude of the construction workforce requirements relative to the size of the surrounding communities indicated that changes in service demands would likely be negligible. The lone potential exception to this finding was to note concerns that if a substantial portion of the construction workforce was actually housed in campgrounds near the entrances to the Park, some additional law enforcement services might be required (Barron, pers. comm. 2002; Dupont, pers. comm. 2002; Racine, pers. comm. 2002).

Impacts on Community Facilities and Services

Impacts on other community facilities and services are also expected to be negligible, with the possible exception of local housing.

Housing. As described in Chapter 3, housing markets in close proximity to GNP are either tight (Flathead County) or constrained by law (Blackfeet Reservation portions of Glacier County). Park staff have also indicated it will not be possible to house any portion of the construction workforce within the Park itself (Babb, pers. comm. 2002).

It appears the most likely housing options for construction workers from outside the study area would be to either rent motel rooms proximate to the Park (if visitation reductions during rehabilitation make sufficient rooms available), rent housing in more distant communities (such as Libby and Cut Bank), or stay in private campgrounds near the Park.

As noted earlier, the latter housing option may place additional demands on local law enforcement.

Environmental Justice

The study area contains large portions of two Indian Reservations — the Glacier County portions of the Blackfeet Reservation and the Lake County portions of the Salish and Kootenai Reservation. Although economic data specific to the reservations is somewhat limited, both areas clearly qualify as low-income populations. The Blackfeet Reservation, in particular, has reported unemployment levels of 70 percent or higher. In fact, Glacier County and Lake County, as a whole, could each be classified as low-income areas. The 1999 per-capita income level in Glacier County was approximately 31 percent below the state average in Montana, while the 1999 per-capita income level in Lake County was approximately 22 percent below the state average.

The data and modeling used to analyze the spatial distribution of economic impacts from changes in visitation and construction activities associated with the alternatives is not sufficiently precise to provide an estimate of the proportion of the impacts that would fall on the tribal land areas within the study area counties. However, given that each reservation comprises the majority of the corresponding county's land area and population and that Lake County and Glacier County as a whole can be considered low-income areas, the distribution of impacts by county provides insight into the potential for disproportionate impacts.

Table 48 depicts projected impacts to output (sales) per capita in Glacier County and Lake County and the study area as a while for each alternative. Comparison of the low income areas to the study area as a whole indicates that disproportionate impacts from reductions in visitation are likely in Glacier County under Alternative 2, Alternative 3, and Alternative 4, but unlikely in Lake County.

This finding results from several factors, including the limited economic base in Glacier County, the relative distance of Lake County from GNP and existence of other major tourist attractions in Lake County including Flathead Lake, and the larger and more diversified economy in other portions of the study area (especially Flathead County), which diminishes the proportionate impacts in that area.

Table 48 also suggests, however, that the disproportionate impacts from changes in visitation in Glacier County may be substantially offset by the economic stimulus provided by Road construction activity and employment. Efforts to ensure participation by members of the Blackfeet Tribe in the construction effort would be an important means of mitigating environmental justice concerns.

Cumulative Impacts

The following summarizes the study team's assessment of potential cumulative socioeconomic impacts from the reasonably foreseeable future actions and events described earlier in this chapter.

Highway and Transportation Projects

In each of the counties within the local impact area, county representatives raised concerns about how traffic congestion resulting from Road rehabilitation would exacerbate delays resulting from other planned highway expansion projects. The representatives of Flathead and Lake counties on the western side (Smith and Johnson, pers. comm. 2002) were focused on the Highway 89 reconstruction projects while Glacier county representatives were more concerned about planned reconstructions along Highway 2 (Overn, pers. comm. 2002).

Table 48. Potential for disproportionate impacts on low income areas from each alternative.

Alternatives	Average Impact on Annual Output per Capita[†]		
	Study Area	Low Income Areas	
		Glacier County	Lake County
Alternative 1 (Baseline)			
From Changes in Visitation[‡]	$0	$0	$0
From Construction Activity	$0	$0	$0
Net Impact	$0	$0	$0
Alternative 2			
From Changes in Visitation[‡]	-$49	-$134	-$22
From Construction Activity	$18	$66	$1
Net Impact	-$32	-$68	-$21
Alternative 3			
From Changes in Visitation[‡]	-$77	-$206	-$34
From Construction Activity	$47	$183	$3
Net Impact	-$30	-$23	-$30
Alternative 4			
From Changes in Visitation[‡]	-$166	-$446	-$72
From Construction Activity	$44	$171	$3
Net Impact	-$122	-$275	-$69

[†]Impacts are annual averages over duration of construction period measured in 2001 dollars. Impacts per capita are relative to 2000 population in each area.

[‡]Visitation impact includes mitigation, as described in this chapter.

Source: BBC 2002.

Tribal representatives likewise noted the potential for additional impacts from Road construction projects. The Salish and Kootenai Tribes operate a local community college that offers a well-respected heavy equipment operator certificate. While such projects may provide employment opportunities for tribal members or other graduates of this program, they may also reduce the potential labor supply for Road rehabilitation (McDonald, pers. comm. 2002).

If Road rehabilitation overlaps with one or more of these planned highway projects, traffic delays and visitor frustration may be increased. If such delays substantially diminish the visitor experience in the local impact area, it is possible that visitation numbers will decline.

National Forest Activities

Anticipated increases in traffic due to either timber salvage operations or forest rehabilitation efforts resulting from the 2001 Moose fire could result in short-term increases in congestion along certain access routes to GNP. Overall, however, a Flathead County Commissioner noted that the forest products industry was declining rapidly in their area (Gipe, pers. comm. 2002). To the extent that activity on National Forest land remains constant or is even

declining, little potential exists for significant cumulative effects from interaction with Road rehabilitation alternatives.

Lewis & Clark Bicentennial Commemoration

Community leaders in the study area expect that the impacts on visitation to their communities and the Park from the Commemoration will be less than proportionate to the projected increases in statewide visitation in the statewide studies. There appears to be general skepticism that the Commemoration will draw as many additional visitors to Montana as the studies have suggested. Further, although there are two documented Lewis and Clark historical sites proximate to the eastern side of the Park (Camp Disappointment and the "Fight site"), the Lewis and Clark expedition was a substantial distance south of the Park when they crossed the mountains and traveled through the far western portions of Montana (Haverfield, pers. comm. 2002; Edgar, pers. comm. 2002; Miller, pers. comm. 2002).

Although the magnitude of additional visitation to the Park may be less than the 30 to 80 percent projected increases in statewide visitation, it appears likely there could be a substantial increase in visitors during the bicentennial period — perhaps especially pronounced on the eastern side of the Park. Great Falls is the center of activity and planning for the Commemoration and it is reasonable to expect that a sizeable proportion of additional visitors to Montana will also wish to visit the Park.

If Road rehabilitation is underway during the Commemoration, traffic delays and visitor frustration may be increased by larger visitor numbers. Anticipated local economic impacts due to reduced visitation during rehabilitation may, however, be at least partly and temporarily offset by the additional visitation resulting from the Commemoration. If the visitor experience is substantially diminished by Road rehabilitation, it is possible that repeat visits further in the future by those who visit the Park for the first time during the Lewis & Clark Bicentennial Commemoration may be diminished. Further, any opportunity for "windfall" local economic benefits from added visitation during the Lewis & Clark Bicentennial Commemoration may be somewhat reduced by Road rehabilitation.

Glacier National Park Centennial

Community leaders in the study area expect the Glacier National Park Centennial celebration to have virtually no impact on visitation to their communities and the Park. The fact that the Park's centennial will be celebrated in 2010 is virtually unknown among the local population, perhaps because it is still 8 years away.

To the extent that local representatives are underestimating the degree to which the celebration will draw additional visitors to the Park, many of the same impacts discussed above under the Lewis & Clark Bicentennial Commemoration will be applicable here. While local economic impacts from reduced visitation may be partly offset by the additional visitation resulting from the celebration, the potential for reductions in repeat visitors does exist.

Regional Population Growth

Growth of the population in the study area can be expected to increase the number of visitors to the Park. Rapid residential growth can also place strains on local infrastructure and government services. Interviews in Flathead County indicated the past decade of rapid growth in rural portions of the county has increased demands for government services without corresponding increases in revenues

(Haverfield pers. comm. 2002; DuPont pers. comm. 2002; Johnson, pers. comm. 2002).

None of the Road rehabilitation alternatives however, are expected to increase long-term population growth in the study area. While some construction workers would be brought to the area on a seasonal basis during the construction period, the numbers of these workers are relatively small compared with the overall population of the study area counties and any effects would be short-term in nature.

Conclusion

Table 49 summarizes the estimated direct and indirect impacts on economic output in the study area from changes in visitation and construction under each of the rehabilitation alternatives. Other than the Repair as Needed Alternative, Alternative 2 has the smallest impacts from changes in visitation during the rehabilitation period, with an estimated impact on output in tourism-related portions of the study area economy averaging about $5.2 million per year and economy-wide impacts from changes in visitation averaging about $7.7 million per year. These impacts would, however, continue to occur over the 20-year duration of this alternative, while impacts under Alternatives 3 and 4 would occur only during the 8- and 7- year periods of construction activity under those alternatives (respectively).

Net impacts on the study area economy can be calculated by combining the anticipated reduction in tourism related output with the expected increases in output in construction related activity. While the net impact calculation is useful in comparing alternatives, it is important to recognize that the effects on visitation and construction do not exactly offset one another. Different businesses are affected

Table 49. Summary and comparison of average annual direct and indirect effects of Road rehabilitation alternatives on study area economic output (2001 dollars).

Economic Sector	Repair as Needed† (No Action)	Priority Rehabilitation	Shared Use (Preferred)	Accelerated Completion
From Changes in Visitation				
Tourism Economy				
Direct Impact	118,000,000	- $5,210,000	- $8,040,000	- $17,366,000
Indirect Impact	55,000,000	- $2,500,000	- $3,530,000	- $9,508,000
Total Economy	173,000,000	- $7,710,000	- $11,570,000	- $26,874,000
From Construction Related Spending				
Construction Sector				
Direct Impact	2,000,000	$2,090,000	$5,560,000	$5,220,000
Indirect Impact	600,000	$630,000	$1,700,000	$1,600,000
Total Economy	2,600,000	$2,720,000	$7,260,000	$6,820,000
Net Economic Impact				
Net Annual Total Impact	**175,600,000**	**- $4,990,000**	**- $4,310,000**	**- $20,054,000**

†Alternative 1 is considered the baseline. Although there would be potential future impacts on visitation if segments of the Road fail, the timing and magnitude of these impacts cannot be projected.

Source: BBC 2002.

by visitation and construction and an economic stimulus to the local construction sector does not necessarily reduce the impact on local tourism related businesses. While up to one half of the construction related jobs are expected to be filled by individuals who normally reside outside the study area, most of the tourism related jobs are likely held by local residents, with the exception of staffing at facilities operated by the Park's concessionaire Glacier Park Incorporated. In general, the construction jobs created by the alternatives are higher paying, but far less permanent, than the tourism related jobs in the study area.

When the positive economic stimulus of construction jobs and construction related purchases of materials and supplies is included, the net economic effects on study area output are smallest under Alternative 3, averaging approximately $4.3 million per year. Net annual impacts of Alternative 2 are fairly similar to Alternative 3, at approximately $5.0 million per year, while net impacts of Alternative 4 are considerably larger at over $22 million per year.

The magnitude of the economic impact estimates can be evaluated by comparison with baseline data for the study area. Based on 1999 data from the IMPLAN model, BBC estimates that annual tourism-related output in the study area economy is approximately $250 to $300 million. Total annual economic output in the study area across all sectors is estimated at approximately $5 billion.

Consequently, the estimated impacts from changes in visitation range from about 2 percent reduction in tourism-related economic activity in the study area under Alternative 2, to about 3 percent for Alternative 3, to about a 6 percent reduction under Alternative 4. Estimated total impacts of all of the alternatives on study area output, including construction and secondary effects, are small relative to the size of the economy as a whole. Even the most adverse net impacts, under Alternative 4, represent less than 1 percent of total study area economic activity.

The net socioeconomic impacts of each alternative, except Alternative 1, which represents the baseline for comparison, are negative. Duration of the impacts is expected to match, or extend slightly beyond, the construction period for each alternative.

Table 50 provides a summary assessment of the intensity of the socioeconomic effects of each alternative. The classification of the intensity of the impacts in this table is based on the impact thresholds provided in Table 29.

CULTURAL RESOURCES

Methodology for Cultural Resources

The EIS analysis of the Going-to-the-Sun Road cultural resource issues was based primarily on a comprehensive inventory of the Road's cultural features conducted during the summer of 2000 (RTI 2001). This inventory identified the historic features of the Road, described their condition, and evaluated their significance. Additional information was obtained from a review of the *Engineering Study* completed for the Road in 2001 (WIS 2001a), which provided broad-based information on needed rehabilitation and described possible design solutions. Recently completed Road rehabilitation projects were also examined, to gauge the impact of such projects on the Road's cultural resources.

Table 50. Assessment of socioeconomic impacts associated with Road Rehabilitation.

	Alternative 1 Repair as Needed (No Action)	Alternative 2 Priority Rehabilitation	Alternative 3 Shared Use (Preferred)	Alternative 4 Accelerated Competition
Visitor Experience/Visitor Use	Negligible Adverse†	Minor Adverse	Minor Adverse	Moderate Adverse
Tourism Economy	Negligible Adverse†	Minor Adverse	Minor Adverse	Moderate Adverse
Overall Economy	Negligible Adverse†	Negligible Adverse	Negligible Adverse	Minor Adverse
Fiscal Impacts	Negligible Adverse	Negligible Adverse	Negligible Adverse	Negligible Adverse
Park Operations	Negligible Adverse†	Minor Adverse	Moderate Adverse	Moderate Adverse
Community Impacts	Negligible Adverse	Negligible Adverse	Minor Adverse	Minor Adverse
Environmental Justice	Negligible Adverse	Negligible Adverse	Negligible Adverse	Moderate Adverse

†Eventual failure of the Road under Alternative 1 could have major impacts on visitor experience/visitor use, the tourism economy, and Park operations and moderate impacts on the overall economy of the study area. The timing and nature of such Road failure cannot, however, be predicted.

Source: BBC 2002.

Effects Common to all Alternatives

Nearly the entire length of the Going-to-the-Sun Road is recognized as a National Historic Landmark, and most of the Road's engineering features are considered historically significant and contribute to its designation as a National Historic Landmark. Other recognized historic resources are adjacent to the Road or nearby. Consequently, any substantive Road rehabilitation program would almost inevitably impact cultural resources. The status of the Going-to-the-Sun Road as a National Historic Landmark requires that the NPS carefully consider all potential impacts to the historic values of the Road during its rehabilitation. While the majority of these impacts would be to the features of the Road itself, the Road's proximity to other significant historic properties means that potential impacts to adjoining cultural resources must be considered, as well.

In the absence of needed rehabilitation, the historical features along the Road will continue to deteriorate. These impacts are currently moderate in scope, but the potential for future major damage to an unrehabilitated Road feature exists.

As discussed in Chapter 3, cultural resources on or near the Road may be categorized into one of four broad groupings, each of which would be impacted differently by Road rehabilitation:

- Archaeological resources (prehistoric and historic);
- Historic resources (the Road itself, related engineering features, nearby buildings/districts);
- Ethnographic resources; and
- Cultural landscapes (including the Road corridor and nearby historic districts)

Since prior archaeological inventory has been completed along most of the Road corridor, and few sites were found, Road rehabilitation for all alternatives would have a negligible effect on known

archaeological resources. Impacts to previously unidentified archaeological sites would be avoided by conducting archaeological survey in unsurveyed areas that may be impacted, and by avoiding any sites that are identified.

Road rehabilitation activities would primarily impact historic resources, in particular the historic structures and engineering features of the Road itself. The precise, site-related impacts to individual features would be dependent on specific project designs. Final designs would be developed with a consideration for preserving the historic significance of Road features. Modification to individual features would combine to affect the overall historic character of the entire roadway.

Short-term adverse impacts of rehabilitation work may include temporary changes to the historic setting of cultural features (caused by the presence of construction equipment or material, for example), or to their "integrity of association" (the spatial or visual relationship of historic features to their site or to other features). Some short-term impacts would be more substantial, such as the likely need to disassemble some historic stone walls as an intermediate step in their rehabilitation. Careful design of individual rehabilitation projects would minimize long-term damage to historically significant resources. Overall, such short-term impacts would be considered as minor to moderate.

Impacts to recognized historic resources other than the roadway itself would be limited by avoiding those resources during rehabilitation work. Any impacts to such features would be short term, and negligible.

Long-term impacts to the cultural features of the Road — both beneficial and adverse — may also result from the rehabilitation process. Adverse impacts may occur when necessary rehabilitation steps lessen the historic integrity of a significant cultural resource. Because rehabilitation projects would be planned in accordance with The Secretary of the Interior's *Standards for the Treatment of Historic Properties*, such impacts would occur only when no practical rehabilitation alternative is available. The overall nature and level of these potential impacts would be a reflection of future, site-specific design decisions; however, some examples of possible adverse impacts include the following:

- The introduction of non-historic materials into a structure during its rehabilitation;
- Changing the historic design or engineering of an historic feature;
- Altering the size, scale, or placement of an historic feature;
- Replacement of an historic feature with a modern structure; or
- Adding a structure or feature where none historically existed.

Because of the precarious location and deteriorated condition of many of the Road's historic features, some of these adverse impacts would be unavoidable for some individual cultural resources. The planned use of appropriate design and construction philosophies, however, would limit most such impacts to negligible or moderate. A series of recommendations addressing the treatment of cultural resources during rehabilitation are found in the *Cultural Landscape Report* for the Road (RTI 2002). Mitigation steps would be required to compensate for any unavoidable adverse effects to the cultural resources of the roadway corridor.

Beneficial, long-term impacts to the cultural resources of the Road would result from the completed rehabilitation of damaged or decayed historic roadway features. Because of the substantial level of damage evident to many of these features, and the likelihood that additional deterioration will

occur, rehabilitation of the Road would result in a moderate to major long-term beneficial impact to these cultural resources.

Road rehabilitation activities would be unlikely to impact the ethnographic values of the Park, since work would primarily be limited to the already-disturbed roadway corridor. Any ethnographic impact that does take place would be short term and negligible.

The cultural landscapes that may be impacted by Road rehabilitation include the roadway corridor itself. The impact of Road rehabilitation to the cultural landscape of the Road may be characterized as the total impact to the historic features of the Road, as described above. These would include minor to moderate short-term adverse impacts caused by construction work, and a moderate to major long-term beneficial impact resulting from the completed rehabilitation of historically significant roadway features. Impacts to other cultural landscapes would be negligible because disruptive construction activities would be designed to avoid these locations.

Effects of Alternative 1 (Repair As Needed)

For Alternative 1, long-term cultural resource impacts resulting from Road rehabilitation would be as described above, but the 50-year rehabilitation time frame would increase adverse cultural resource impacts caused by damage and decay to unrehabilitated roadway features. Under Alternative 1, these adverse impacts would combine and increase over time, with the potential to ultimately become major in scope. The potential for catastrophic Road failure and loss of historic structural features is greatest for this alternative because of the extended rehabilitation period. Alternative 1 would also lengthen the time period in which adverse impacts are present, and the delay in the completion of rehabilitation would postpone the long-term, beneficial impacts of the work.

Overall, adverse impacts to cultural resources would be greatest under Alternative 1.

Effects of Alternative 2 (Priority Rehabilitation)

The Alternative 2 rehabilitation process would produce overall cultural resource impacts similar to those described under Alternative 1, but because the rehabilitation period would be reduced to 20 years, the duration and severity of adverse impacts associated with deterioration of historic features would be somewhat reduced, but would still be moderate to major. These adverse impacts, however, would remain greater than those found under Alternatives 3 and 4. A moderate, long-term beneficial improvement to cultural resources would occur following rehabilitation.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion).

The short-term and long-term cultural resource impacts under Alternatives 3 and 4 would be similar to those described as common to all alternatives. However, these alternatives would complete rehabilitation work in less than 8 years and, thus, provide the best opportunity to preserve the historic structural features before significant further deterioration occurs.

Additional impacts would take place under these alternatives, however, as a result of the planned visitor use improvements at several locations along the Road. Adverse cultural resource impacts would

result from the construction of modern improvements in the historic roadway corridor. In most cases, these impacts would be negligible to minor because visitor use improvements are located primarily within and adjacent to existing roadside developments; however, improvements located in visual proximity to historically significant resources have the potential to affect them. Careful siting and design of visitor use improvements would be used to minimize adverse impacts.

Cumulative Effects

Other Road improvements, developments, and planned activities in the Park may also affect cultural resources in and near the Road corridor. If the Park's CSP is implemented, this may result in beneficial or adverse impacts to cultural resources near the Road at the developed areas of Apgar, Lake McDonald, and Rising Sun depending on the nature of the improvement. No major future actions impacting cultural resources are currently foreseen for other portions of the roadway corridor.

Because the potential adverse cultural resource impacts caused by the proposed Road rehabilitation are short-term, and are outweighed by long-term, beneficial impacts, the proposed rehabilitation would have a positive cumulative effect on cultural resources for all alternatives. The additional visitor use improvements specified in Alternatives 3 and 4, when added to other actions, would have a minor adverse cumulative effect on cultural resources because proposed improvements occur primarily within existing facilities.

Conclusion

For all alternatives, adverse short-term cultural resource impacts would result both from the rehabilitation process itself and from additional deterioration caused by the failure to perform needed rehabilitation in a timely manner. In general, these impacts would be minor to moderate. They would be most pronounced under Alternative 1, and least severe under Alternatives 3 and 4.

Long-term adverse impacts for all alternatives are possible if engineering requirements force the modification of one or more historic Road feature, but adherence to The Secretary of the Interior's *Standards for the Treatment of Historic Properties* will limit these impacts. Any adverse impacts would be outweighed by the long-term benefit resulting from the rehabilitation of the Road's historic engineering features and maintenance of its status as a National Historic Landmark. Beneficial, long-term impacts would be realized most quickly under Alternatives 3 and 4. The proposed visitor use improvements specified under Alternatives 3 and 4 would create negligible to minor long-term adverse impacts at the development locations.

NATURAL RESOURCES

Topography, Geology, and Soils

Methodology for Topography, Geology, and Soil Effects

Previous studies and investigations within the Park that characterize existing geologic and soil resource conditions were used to identify potential effects on topography, geology, and soils. Potential impacts were qualitatively and quantitatively estimated based on anticipated levels of earthwork, excavation, and soil disturbance from proposed Road rehabilitation and other improvements.

Topography and Geology

Effects Common to All Alternatives. Rehabilitation work for all alternatives would be conducted primarily within or adjacent to the existing Road. Repair and rehabilitation of retaining walls, guardwalls, and the roadway surface would result in minor impacts to the topography and geologic formations. No substantial earthwork or excavation outside of the existing roadway prism is anticipated, except at localized sites as necessary to implement rehabilitation repairs. Removing or formalizing informal pullouts would result in a minor beneficial long-term effect by stabilizing off-shoulder gravel pullouts by paving or revegetating. Selective site-specific rock scaling would not substantially alter existing rock outcrops, but would have a minor long-term effect to roadside geology. Vista clearing would not affect slope stability and would have a negligible short-term effect on topography and geology throughout the Road corridor. Overall, Road rehabilitation would result in minor short-term and long-term effects to the landscape and geologic features present on the Road. Effects would be detectable, but not readily apparent.

Effects of Alternative 1 (Repair as Needed). Implementation of rehabilitation work on the Road over 50 years would have minor to moderate long-term effects on topography and geology primarily in the higher elevation portions of the Road. Erosion of roadway cut and fill slopes would result in instability and could lead to Road failure with damage to local geologic features and a change to the landscape.

Effects of Alternative 2 (Priority Rehabilitation). Effects on topography and geology would be similar to Alternative 1, although Road deficiencies would be repaired in 20 years, and instabilities and erosion concerns would be addressed sooner.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Implementation of needed Road rehabilitation within a shorter time frame than Alternatives 2 and 3 would provide for correction of roadway instabilities and erosion that could damage geologic and landscape features.

Additional visitor use improvements implemented with Alternatives 3 and 4 would affect topography and geology at localized sites. Grading and drainage work to improve pullouts and parking areas, and construct slow-moving traffic lanes would only result in minor long-term changes to the topography and associated geology since all work would be conducted within and adjacent to existing disturbances. Construction of transit parking areas near Apgar would result in a moderate long-term change in the landscape for both alternatives, but parking sites would be located on relatively flat terrain to minimize earthwork. Construction of new short trails and rehabilitation of existing trails would be done to minimize ground and surface disturbance with only minor long-term effects to topography and geology. Formalizing or reclaiming social trails near pullouts would prevent further damage to the landscape. Other proposed improvements to toilets, and visitor orientation, information and interpretation sites would have negligible to minor short-term effects on topography and geology.

Soils

Effects Common to All Alternatives. Disturbance to soil resources from excavation, grading, and compaction during rehabilitation activities would be similar for all alternatives. Minor short-term disturbance of soil resources outside of the existing Road prism would be needed at some locations to access the base of retaining walls, install culverts, and conduct other roadway repairs. Rock scaling at

site-specific locations may result in minor short-term disturbances to soil resources, but revegetation of disturbed areas would minimize long-term effects. Only minor short-term disturbances to soil resources would occur at staging areas within the Park since these areas have been previously disturbed. Paving or revegetating informal pullouts would be a beneficial minor long-term improvement by reducing erosion. Roadside vegetation clearing would have a negligible short-term effect on soil resources because trees and shrubs would be selectively removed with minimal surface disturbance.

Overall, a minor short-term loss of soil material from wind and water erosion would be likely at localized sites along the Road during construction and until disturbed areas can be revegetated. Erosion and sediment control best management practices (BMPs) would be implemented to minimize soil loss. A minor short-term loss in soil productivity would occur from disruption of soil biological processes and changes in the soil physical properties from construction disturbance and compaction. Topsoil salvage, replacement, and revegetation would minimize the long-term effect on soil productivity.

Effects of Alternative 1 (Repair as Needed). Implementation of rehabilitation over 50 years would delay drainage and slope stability improvements. This would lead to continued erosion and loss of soil material and productivity and would have a moderate long-term adverse impact on soil resources at site-specific locations.

Effects of Alternative 2 (Priority Rehabilitation). Extending needed repairs to drainage and slope stability over 20 years would result in a moderate long-term loss in soil and soil productivity similar to Alternative 1.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Moderate long-term soil disturbance and loss would occur for Alternatives 3 and 4 from implementation of visitor use improvements such as construction of slow-moving vehicle turnouts, new pullouts and parking areas, and trail construction. Most pullout improvements would occur within existing areas of disturbance and would result in negligible short-term soil disturbance. Construction of up to six slow-moving vehicle pullouts would result in the long-term loss of soil productivity on about 0.2 acres (0.08 hectares). Proposed improvements to the Wild Goose Island pullout and the addition of the Baring Creek Cabin Trailhead would have a long-term adverse effect on about 1.25 acres (0.5 hectares), although abandoned parking areas at the Wild Goose Island Overlook would be reclaimed. The conversion of the Logan Pit staging area and the Sun Point parking area into oversize vehicle turnarounds following Road rehabilitation would have only a minor site-specific effect on soil resources because these areas have been previously disturbed.

Proposed trail construction and rehabilitation at existing pullouts would result in a moderate, long-term, site-specific effects to soil resources on about 2 acres (0.8 hectares). Trails would be located and maintained to minimize erosion. Formalizing existing social trails at pullouts, such as the trail at Red Rock Point, Lunch Creek, and Big Bend, would have a beneficial moderate long-term effect to soil resources by eliminating multiple social trails and reducing erosion. Construction of a transit parking area near Apgar would result in moderate long-term loss in soil productivity on 2 acres (0.8 hectares) for the preferred alternative, and 4 acres (1.6 hectares) for the Accelerated Completion Alternative. Paving of the parking lots would minimize long-term erosion. Reconfiguration of the existing St. Mary Visitor Center parking lot to designate transit

parking spaces would have a negligible short-term effect on soil resources for both Alternatives 3 and 4 because no new ground disturbance would be necessary.

Other visitor use improvements including installation of visitor orientation stations, toilets, and exhibits would have negligible to minor short-term effects on soil resources at specific sites because of the limited area of disturbance. For all visitor use improvements, erosion control BMPs would be used to minimize the loss of soil resources.

Cumulative Effects

In addition to other regional highway projects, the preferred alternative and other alternatives would have a minor cumulative effect on topographic, geologic, and soil resources. Timber salvage and restoration activities at the Moose Fire site on Flathead National Forest may result in an increase in soil erosion, but the incremental effect of soil loss from Road rehabilitation would not add appreciably to the cumulative effect. Disturbances from implementation of other transportation improvement projects in GNP would occur within or adjacent to existing roads to minimize the creation of new developments. Other future improvements in the Park, such as implementation of improvements to lodges and concessioner facilities could introduce new ground disturbances. The combined impact of past actions, the proposed and alternative actions, and foreseeable future projects inside and outside of the Park would have a minor cumulative effect on soil, topography, and geologic resources.

Conclusion

Rehabilitation of the Road would result in minor short-term effects to topography, geology, and soils from excavation, temporary soil disturbance, and a minor long-term effect from rock scaling for all alternatives. Moderate levels of long-term loss in soil productivity and geologic impacts are possible for Alternatives 1 and 2 if rehabilitation work is delayed and existing erosion or subsequent Road failure causes resource damage. Implementation of additional visitor use improvements for Alternatives 3 and 4 would result in similar minor short-term effects for most improvements. A moderate long-term loss of soil productivity (3.5 acres; 1.4 hectares) for Alternatives 3 and 4 would occur from construction of new pullouts and trails and rehabilitation of existing facilities. A similar loss in soil productivity would occur from construction of a transit parking area near Apgar (2 acres [0.8 hectares] for Alternative 3, and 4 acres [1.6 hectares] for Alternative 4).

There would be no major adverse impact to topography, geology, or soils whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Water Resources

Methodology for Water Resource Effects

Potential effects to hydrology and water quality were qualitatively estimated based on the amount of soil disturbance, proximity of construction activities to streams and lakes, and planned mitigation measures to control runoff and prevent sedimentation. Floodplain effects were determined based on previous NPS and FHWA studies of Divide Creek.

Hydrology and Water Quality

Effects Common to All Alternatives. There would be no measurable change in surface runoff or ground water hydrology for any of the alternatives. An overall moderate long-term beneficial effect on surface hydrology and water quality would occur from drainage improvements that collect and dissipate roadway runoff, protect drainage inlets, and outlets, and direct runoff to minimize erosion.

All of the alternatives have the potential for short-term increases in stream sedimentation and turbidity from erosion of disturbed soils near active work sites. The greatest potential for impacts to water quality occur where the Road borders or crosses creeks, streams, and lakes including McDonald Creek, Lake McDonald, and St. Mary Lake. Unavoidable minor short-term introduction of sediment into watercourses is possible for some roadwork, such as culvert replacement, bridge repairs, or drainage improvements. Vista clearing would have a negligible short-term effect on water resources because of the limited surface disturbance.

Atmospheric deposition of particulates into streams and lakes may increase due to dust from construction equipment and vehicles. Expected sediment increases would not result in measurable water quality degradation or loss of beneficial uses. Effects to water quality are expected to be minor, short term, and localized for all alternatives because of the limited soil disturbance needed to rehabilitate the Road and the planned implementation of erosion and sediment control BMPs to prevent erosion and contain sediment within work zones.

Effects of Alternative 1 (Repair as Needed). Under the Repair as Needed alternative, drainage improvements to the Road would be implemented over 50 years. Although repairs would address inadequate roadway drainage, existing adverse effects to surface water and water quality would continue until improvements are implemented. Further roadside erosion and poor drainage would continue and are likely to contribute to moderate long-term adverse impacts on water quality at localized sites.

Effects of Alternative 2 (Priority Rehabilitation). This alternative would rehabilitate the Road over 20 years and would address existing deficiencies in roadway drainage. Similar to Alternative 1, improvements would not be implemented soon enough to prevent further impacts to water quality as the Road continues to deteriorate. Moderate long-term adverse impacts to water quality would continue until repairs are implemented.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Implementation of additional visitor use improvements for Alternatives 3 and 4 also have the potential to affect hydrology and water quality. Proposed pullout improvements would be mostly confined to small work zones with minor direct short-term impacts to water resources likely during construction. The addition of a new Baring Creek Cabin Trailhead would increase the amount of impermeable surface and runoff, but the proposed site is located away from water resources. Improvements at the Wild Goose Island pullout would also increase impermeable surface, but revegetation of abandoned parking areas would partially offset impacts. The addition of slow-moving vehicle pullouts could likewise result in minor short-term erosion affecting water quality. Pullouts would be located to avoid direct impacts to water bodies. Implementation of erosion control measures including revegetation of disturbed areas would minimize potential effects for all visitor use improvements. As a result, only minor, short-term disturbances to surface hydrology and water quality are likely. No long-term adverse impacts from these improvements are anticipated, although the

increased impermeable surface would result in a long-term minor increase in runoff near areas of new pavement.

Proposed trail improvements and construction of new short trails would have a minor short-term effect to water quality during construction, but stabilization techniques, and reclamation of disturbed areas would minimize this effect. Rehabilitation of social trails at locations including Red Rock Point, Lunch Rock, Wild Goose Island Overlook, and other pullouts would have minor to moderate long-term beneficial effects on water quality by reducing erosion, particularly on trails that lead to water features.

The construction of transit staging areas for Alternatives 3 and 4 would have negligible long-term effects on hydrology and water quality. The additional paved parking (Alternative 3: 2 acres [0.8 hectares]; Alternative 4: 4 acres [1.6 hectares]) would increase localized runoff due to the additional impermeable surface area. These sites would be located away from water sources, and drainage control measures would capture and dissipate runoff to minimize effects to water quality.

Oversize vehicle turnarounds at Logan Pit and Sun Point would be established after rehabilitation work because these sites would be used as staging areas. At Logan Pit, a vegetation buffer and topographic barriers would be maintained between the vehicle turnaround and adjacent McDonald Creek to minimize the potential for erosion or water quality degradation. The Sun Point turnaround is not immediately adjacent to water features, but drainage control structures would be used to minimize water quality effects. Both turnarounds would have negligible to minor short-term effects on water resources at these site-specific locations.

Proposed toilet rehabilitation and new facilities would have negligible short-term effect on water resources adjacent to the Road. Toilets would be installed to standards to prevent leakage and ground water contamination and scheduled maintenance of these facilities would protect water resources.

Other proposed visitor use improvements such as the east side orientation station and pullout exhibits would have negligible short-term effects on hydrology and water quality.

Floodplains

Effects Common to All Alternatives. Portions of the Going-to-the-Sun Road are subject to periodic flooding and proposed rehabilitation work for all alternatives would not add to the potential for increased flooding or long-term damage. Planned elevation of the Road and/or use of low water crossings at Divide Creek would have a moderate to major beneficial effect by protecting the Road from periodic flood damage and allowing a more natural dispersion of flood flows. Overall, Road rehabilitation would have a negligible short-term effect on localized flooding because other than Divide Creek, there would be no substantial changes to the roadway location or elevation.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). There would be no additional effects to floodplains other than those common to all alternatives.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Proposed visitor use improvements would not result in substantial changes in topography or addition of structural features within floodplains that would affect the potential for flooding, thus, there would be a negligible effect on floodplains.

Cumulative Effects

Regional transportation projects, Forest Service timber salvage operations, other roadwork and commercial service developments in the Park may affect water resources near site-specific projects. The incremental effect of proposed Road rehabilitation for all of the alternatives, and additional visitor use improvements for Alternatives 3 and 4 when added to other reasonably foreseeable actions, would have only a minor cumulative effect on water resources.

Future plans for relocation of Park employee housing, administrative, and maintenance facilities near Divide Creek to prevent damage from flooding, along with proposed roadwork near Divide Creek, would have a moderate to major long-term beneficial effect by protecting Park resources from periodic flooding for all alternatives. For other Road rehabilitation work for all alternatives, and for visitor use improvements for Alternatives 3 and 4, there would be a negligible cumulative effect to floodplains because of the limited disturbance within floodplains.

Conclusion

Road rehabilitation for Alternatives 1 and 2 would result in moderate long-term effects to hydrology and water quality due to the extended construction period and delay in implementing drainage repairs. Alternatives 3 and 4 would have a minor short-term effect on hydrology and water quality at localized sites during construction. Proposed improvements in drainage, which would address existing areas of inadequate drainage and erosion adjacent to the Road, would provide a minor to moderate beneficial effect to local water quality over the long term. Benefits would be greatest for Alternatives 3 and 4, which implement drainage improvements over a shorter time. Similar minor short-term effects to hydrology and water quality would occur with implementation of visitor use improvements for Alternatives 3 and 4. Planned revegetation of disturbed areas for all alternatives would minimize adverse effects to hydrology and water quality.

Road improvements for all alternatives would have negligible short-term effects on floodplains and flooding because there would be no substantial change in roadway alignment or elevation. Planned elevation of the Road or installation of low water crossings near Divide Creek would better dissipate flood flows. This improvement would have a moderate to major, beneficial, long-term effect by protecting the Road from flood damage and improving flood flows. Roadwork is exempt from compliance with Executive Order 11988, Floodplain Management.

There would be no major adverse impact to water resources, including hydrology, water quality or floodplains whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Vegetation

Methodology for Vegetation Effects

The determination of potential effects to vegetation was quantitatively estimated based on anticipated loss of vegetation from construction of new facilities. A qualitative assessment was used to estimate temporary impacts to vegetation based on anticipated concentration of work within existing areas of disturbance and planned mitigation

measures to revegetate following construction work. Previous successful revegetation efforts and noxious weed control efforts in the Park provide an indication of the high potential for success in reclaiming disturbed areas.

Effects Common to All Alternatives. Rehabilitation of the Road is confined primarily to the existing roadway prism, which includes the paved Road surface and adjacent cut and fill slopes that were created during original Road construction. Disturbance to roadside vegetation as well as additional disturbance outside of the Road prism would occur during rehabilitation. All of the vegetation communities, from grassland to alpine, bordering the Road could be disturbed during construction work. Removal of mature trees is expected to be minimal, although any trees that pose a safety hazard would be removed.

The extent of the disturbance to vegetation depends on the particular rehabilitation activity. Lower elevation sections of the Road that only require paving would have negligible to minor short-term effects on roadside vegetation. Locations needing extensive retaining wall or guardwall repairs would require minor to moderate short-term localized impacts to vegetation to allow equipment and worker access. Vegetation may be directly affected by clearing or trampling. Construction activities that result in ground disturbance in the spring when soils are moist may damage plant roots. Plant disturbance in the fall may not allow plants time to recover prior to winter.

Logan Pit is the only staging area within the Park with scattered vegetation. Additional trampling or disturbance of vegetation within this active maintenance yard would be minor and long term. Potential impacts to vegetation are possible if the contractor chooses to establish staging areas outside of the Park, but the location of these sites, if needed, would not be identified until construction is scheduled.

Proposed paving of informal pullouts would have a negligible effect on vegetation because these areas are currently gravel. Reclamation of informal pullouts would be a minor long-term beneficial improvement to vegetation because these areas would be planted with native vegetation.

Planned vista and roadside clearing of vegetation that has been established since original Road construction would require selective clearing of trees and shrubs at scenic view points such as The Loop, Jackson Glacier Overlook, and other scenic vistas. Removal of roadside vegetation would be an on-going maintenance operation to maintain scenic overlooks and views into the forest and would follow guidelines developed in a vegetation management plan. Overall, vegetation clearing would have a minor long-term effect on native vegetation communities because it would be limited to select locations adjacent to the Road.

The introduction of exotic non-native plant species is a concern for all alternatives. Soil disturbance associated with rehabilitation work increases the potential for the establishment and spread of noxious weeds. Prompt revegetation of disturbed sites with native vegetation and implementation of a weed management program would help prevent the infestation of noxious weeds. Sites with existing weeds are more likely to continue to support weeds.

For all alternatives, extensive reclamation and revegetation efforts would be used to stabilize existing eroding roadside slopes as well as those areas temporarily disturbed during rehabilitation. This includes measures such as topsoil salvage, seed collection, selective use of soil amendments, and monitoring of revegetation success.

Effects of Alternative 1 (Repair as Needed). Implementation of Road rehabilitation over 50 years would allow existing unstable slopes to continue deteriorating. This would result in a moderate long-term adverse impact to vegetation. Delay of revegetation and slope stabilization work may require extensive remediation work in the future to repair damaged areas.

Effects of Alternative 2 (Priority Rehabilitation). Moderate long-term adverse impacts to vegetation similar to Alternative 1 are possible if revegetation of existing unstable slopes is implemented over 20 years.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Proposed improvement to visitor use facilities included in Alternatives 3 and 4 would result in both beneficial and adverse effects to vegetation. The addition of three slow-moving vehicle pullouts on the west side of the Continental Divide and two to three along the St. Mary segment of the Road would result in a minor long-term loss of about 0.2 acres (0.08 hectares) of roadside vegetation. Reconfiguration of the Wild Goose Island pullout along with a slight shift in the Road alignment would result in the disturbance of about 0.75 acres (0.3 hectares) of shrub and forest vegetation, although existing parking areas on the north side of the Road would be revegetated with native plants. Construction of a new Baring Creek Cabin Trailhead would require the minor long-term loss of about 0.5 acres (0.2 hectares) of mixed coniferous and deciduous forest. Proposed improvements at other pullouts, parking areas, and trails (2 acres; 0.8 hectares) would have minor long-term effects on vegetation. Establishment of an oversized vehicle turnaround at Logan Pit would likewise occur within an existing area of disturbance, and revegetation of areas not needed for the turnaround would result in a minor long-term benefit to vegetation.

Developing short new trail segments at pullouts and rehabilitating and formalizing social trials would result in a direct disturbance to vegetation for trail construction, but would be a beneficial impact by helping define visitor access routes and eliminating trampling and vegetation disturbance that presently occurs along multiple social trails. Trails would be sited to avoid adverse impacts to important plant communities and no cutting of mature trees is anticipated.

Construction of 2 acres (0.8 hectares) of transit parking for Alternative 3 and 4 acres (1.6 hectares) for Alternative 4 would result in a minor long-term loss of vegetation near Apgar. Disturbance would occur to primarily lodgepole pine forest within the western red cedar/western hemlock habitat type.

Other proposed improvements including new and upgraded toilets, and visitor exhibits, interpretive sites, and orientation stations would have negligible to minor long-term effects to vegetation at small localized sites adjacent to the Road.

Cumulative Effects

The limited impacts to vegetation from proposed Road improvements for all of the alternatives would be negligible when added to the effects of other regional transportation projects. Similar minor cumulative effects would occur with other planned GNP roadwork because work would be confined to existing Park roads rather than construction of new roads. The incremental effect on vegetation from proposed Road rehabilitation in addition to Forest Service salvage and reclamation work of the Moose fire would have a minor cumulative effect. Additional vegetation disturbance in the Park is possible if the CSP is implemented. The incremental impact on vegetation from rehabilitation of the Going-to-the-Sun Road in addition to CSP

impacts would result in minor long-term cumulative effects.

Visitor use improvements included in Alternatives 3 and 4 would add only minor cumulative effects to vegetation at the regional and Park-wide scale when combined with reasonably foreseeable actions.

Conclusion

Rehabilitation of the Road would result primarily in minor short-term disturbances to roadside vegetation during construction for all alternatives. Vegetation management would remove roadside vegetation at select locations throughout the Road corridor, but would have a minor short-term effect on native plant communities.

Alternative 3 would result in minor long-term loss (5.5 acres; 2.3 hectares) in vegetation, from construction of slow-moving vehicle pullouts, improvements to pullouts and parking areas, construction of transit staging areas and new trails. Visitor use improvements at existing pullouts along with toilet improvements, and installation of visitor orientation facilities would have a negligible short-term impact on vegetation. Impacts from Alternative 4 would be similar, but an additional 2 acres (0.8 hectares) of vegetation would be disturbed for construction of a larger transit staging area near Apgar.

For all alternatives the introduction of exotic plant species is possible with soil disturbances. Monitoring and BMPs would be implemented to minimize the introduction and spread of these species. All alternatives would implement revegetation measures to rapidly plant areas disturbed during construction.

There would be no major adverse impact to vegetation resources whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Wetlands

Methodology for Wetland Effects

Wetland impacts were evaluated based on previous Park surveys for wetlands near the Road and the anticipated types of rehabilitation work that would be conducted near wetlands. A quantitative determination of wetland impacts was not made because it is anticipated that a direct loss of wetlands can be avoided. Temporary impacts to wetlands would be evaluated prior to implementation of each phase of rehabilitation.

Effects Common to All Alternatives. Proposed rehabilitation work on the Going-to-the-Sun Road for all alternatives is expected to have a negligible to minor short-term effect on wetlands. Wetlands near the Road would be avoided to the maximum extent possible. All wetlands near work zones would be identified and marked to prevent inadvertent disturbance during construction. Silt fences or other barriers would be used to capture sediments and prevent indirect impacts to wetlands located downslope from construction areas. Indirect impacts on wetlands from changes in supporting hydrology would be avoided by maintaining the existing ground water or surface flow with culverts or subsurface drainage. Minor short-term impacts to wetlands may occur for repairs such as culvert replacement. Affected wetlands would be promptly restored with no loss in function or values.

Effects of Alternative 1 (Repair as Needed). No additional direct impacts to wetlands were identified for Alternative 1. Implementation of Road drainage improvements over 50 years would continue to cause erosion that could indirectly affect nearby wetlands.

Effects of Alternative 2 (Priority Rehabilitation). Potential indirect effects to wetlands would be similar to Alternative 1 if drainage repairs are implemented over a 20-year period.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Implementation of visitor use improvements for Alternatives 3 and 4 would have a negligible short-term effect on wetlands. Wetlands near parking areas, pullouts, and toilets would be avoided. New trails would be located away from wetlands. Construction of a pedestrian bridge over Avalanche Creek may result in a minor short-term disturbance to wetlands, but there would be no wetland loss and the site would be restored following construction. None of the other visitor use improvements including visitor orientation, information or interpretive exhibits would affect wetlands.

Cumulative Effects

There would be negligible cumulative effects to wetlands for all of the alternatives. Wetlands would be avoided for Road rehabilitation work and visitor use improvements.

Conclusion

Road rehabilitation would avoid wetlands to the greatest extent possible. Negligible to minor short-term disturbances to wetlands could occur from culvert replacement or work near drainages. Prompt restoration of disturbed wetlands following construction would not affect wetland functions or values and would not require wetland mitigation. Similar negligible to minor effects to wetlands would occur from implementation of visitor use improvements for Alternatives 3 and 4.

There would be no major adverse impact to wetlands whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Wildlife

Methodology for Wildlife Effects

Determination of effects to wildlife from alternative actions is difficult to quantify. Impacts to wildlife are not readily measured or observable. Potential impacts to wildlife were determined from the estimated loss of habitat, inference from other studies and scientific literature, and the knowledge of Park wildlife biologists familiar with wildlife activity.

Effects Common to All Alternatives. Proposed Road rehabilitation for all alternatives would result primarily in short-term impacts to wildlife during construction. The intensity of impact to wildlife depends on several factors including the type of construction activity, location, time of day, season, and the particular species. Projects that use heavy equipment for excavation, such as removal of the roadbase, would create more noise and disturbance than masonry work. The season of construction would also influence wildlife response to construction disturbance. All of the alternatives would initiate construction activities in the spring

and extend work into the fall as weather conditions permit. Construction activities in the spring and fall would have a greater adverse effect on wildlife because wildlife are generally accustomed to less visitor activity than during the summer visitor use season. Many species of wildlife are more vulnerable to the effects of human-induced stress in spring and fall when energy expenditures are greatest and food resources are less abundant. Time of day for construction activity would potentially affect wildlife. All alternatives, except possibly Alternative 1, include potential work at night to facilitate rapid completion of work. The noise, disturbance, and artificial light would adversely affect some species.

The direct loss of wildlife habitat would be minor for all alternatives. The majority of roadwork would be conducted within the prism of the existing Road with only a minor long-term loss of habitat adjacent to the Road. Short-term losses of habitat would occur adjacent to the Road from temporary disturbances during construction. These disturbances would be reclaimed and planted with native vegetation following construction. In the short term, habitat quality of revegetated areas would be lower than existing habitat. Over the long term, habitat quality of revegetated areas would be similar to existing habitat.

Proposed rehabilitation may create additional habitat fragmentation or reduce connectivity for wildlife movement. Work on the Going-to-the-Sun Road would occur within the existing corridor but could introduce additional temporary barriers to wildlife movement. The magnitude of the effect would depend on the extent and timing of construction and likely be a minor to moderate short-term impact. Culverts would be appropriately sized to accommodate wildlife. Rehabilitation work would have no effect on design speed or posted speed limits, so the potential for wildlife/vehicle collisions would not change.

The zone of influence (the area in which wildlife potentially could be affected by disturbances such as noise, light, and human activity) extends beyond the edge of the existing Road and varies with topography, vegetation, and type of human disturbance. Disturbance to wildlife from construction-related noise, disturbance, and artificial lighting would be minor to moderate. Wildlife displacement and avoidance of the Road during construction is likely for some species. Species such as black bears, which are active primarily in the early mornings, evenings, and at night, may be adversely affected by night construction. Other mammals such as elk, deer, mountain lion, mountain goats, and bighorn sheep also may be temporarily displaced by noise and disturbance during construction. Various bird species along the Road could be temporarily displaced to other suitable habitat during construction. Most raptors and other large birds are unlikely to nest adjacent to the Road because of the existing traffic and human activity, but construction noise and disturbance could further shift bird nesting away from the Road. Biannual raptor migration through the Park is unlikely to be affected by planned rehabilitation. Temporarily displaced wildlife would return following completion of construction. There would be no impact on wildlife in the winter.

Vista clearing would remove roadside vegetation at select locations. The loss of vegetation would have a negligible effect on wildlife because of their infrequent use of this habitat and the small area of clearing. Removal of trees could reduce perching and foraging sites for some birds, but the impact is unlikely to be perceptible. Surveys for nest sites would be conducted prior to clearing.

As discussed in Chapter 2, a number of mitigation measures would be implemented during construction to minimize impacts to wildlife and their habitat, including seasonal construction restrictions at sensitive locations, provisions for wildlife crossings through culverts under the Road, and minimizing the area of construction disturbance.

Effects of Alternative 1 (Repair as Needed). Impacts to wildlife would be similar to those common to all alternatives. Rehabilitation work would be spread over 50 years, so annual construction activity would be limited to smaller work zones than for other alternatives. Wildlife are less likely to be affected by rehabilitation work confined to smaller areas; however, continuous construction activity over 50 years could result in displacement of wildlife activity near the Road or habituation to human activity and construction disturbance. Should a catastrophic Road failure occur, it may require emergency repairs of a magnitude that could limit wildlife mitigation options.

Effects of Alternative 2 (Priority Rehabilitation). Impacts to wildlife would be similar to Alternative 1, although additional work zones would be used to complete work within 20 years.

Effects of Alternative 3 — Preferred (Shared Use). Alternative 3 would implement Road repairs over 7 to 8 years, which would require multiple construction zones each year. Disturbance to wildlife would be spread over a larger portion of the Road than Alternatives 1 and 2. Indirect impacts to wildlife from construction disturbance would have a minor to moderate short-term effect on wildlife and is likely to result in displacement and changes in movement to some species.

The implementation of visitor use improvements with Alternative 3 would result in a direct loss of wildlife habitat and additional disturbance during construction. Minor habitat loss (0.2 acres; 0.08 hectares) would occur from construction of slow-moving vehicle pullouts. The majority of this disturbance would be to roadside vegetation, which is infrequently used by wildlife. The addition of slow-moving pullouts would slightly increase the crossing distance for wildlife in these locations, but the pullouts would be less than 120 feet (40 meters) long and are expected to have a minor long-term effect on wildlife movement for most wildlife species.

Additional minor long-term losses of habitat (1.25 acres; 0.5 hectares) would occur with proposed improvements to the Wild Goose Island Overlook and construction of the Baring Creek Cabin Trailhead. Wildlife use at the Wild Goose Island Overlook is limited because of existing human activity and traffic. Construction of the Baring Creek Cabin Trailhead would result in long-term moderate impacts to wildlife by adding human activity to a relatively little used site between two existing hubs of activity, Baring Creek/Sunrift Gorge and Sun Point. This is a natural crossing area for wildlife because of terrain features, and the existence of developed sites on either side. The addition of connector trails in the area would further impact wildlife in this narrow corridor. Use of the Logan Pit area for construction staging and later for a permanent oversized vehicle turnaround and parking area would result in long-term moderate impact to wildlife by converting a site used by Park maintenance staff for storage and construction staging into a permanent visitor use site. Incidental disturbance to wildlife habitat would occur at other pullouts because work would take place within areas of existing disturbance.

Construction of a 2-acre (0.8-hectare) transit parking lot near Apgar would result in a minor long-term loss of forest habitat. Traffic and human activity likely would displace wildlife activity near the

parking lot during the summer. The planned location of the parking area near the Road and existing visitor development would minimize wildlife impacts. There would be no loss of habitat at the St. Mary Visitor Center from reconfiguring the existing parking lot to accommodate transit service parking. The expansion of transit service for this alternative would have a negligible beneficial short-term effect on wildlife by slightly reducing traffic.

Proposed construction of short new trail segments from existing pullouts and formalizing existing social trails would result in a minor long-term loss of habitat of about 2 acres (0.8 hectares). Trails would be constructed within existing visitor activity areas adjacent to the Road and other visitor developments where wildlife activity is limited. Additional human activity along these trails may also result in a minor long-term disturbance or displacement to wildlife, but would not affect species populations.

Other planned visitor use improvements including new toilets, installation of visitor orientation and information stations and new exhibits would have a negligible effect on wildlife habitat or activity because of the limited new disturbance and confinement of improvements to the existing visitor service zone.

Effects of Alternative 4 (Accelerated Completion). Impacts to wildlife for Alternative 4 would be similar to Alternative 3, except work would be completed in as few as 6 years and disturbance to wildlife would occur over a shorter period of time. An accelerated work scheduled likely would have a similar number of work sites as Alternative 3, but because traffic would be suspended during the week, rehabilitation could be completed more efficiently and quickly.

Construction of a 4-acre (1.6-hectare) transit parking lot near Apgar would result in a minor long-term loss of forest habitat and a displacement of wildlife activity during the summer. As with Alternative 3, impacts would be minimized by locating the parking area near existing visitor and traffic areas. Additional expansion of transit parking spaces at the St. Mary Visitor Center would be located within the existing parking lot and would not affect wildlife.

Further expansion of transit service to 14 vehicles would reduce the number of vehicles on the Road, which would have a negligible but beneficial effect on wildlife.

Impacts to wildlife from other visitor improvements would be similar to Alternative 3. Overall, there would be a minor to moderate short-term effect on wildlife during rehabilitation and implementation of visitor use improvements, with a minor long-term impact to wildlife habitat from transit parking, trails, and pullout improvements.

Cumulative Effects

Anticipated impacts to wildlife from implementation of Road improvements for all alternatives and visitor use improvements for Alternatives 3 and 4 would have a minor cumulative effect on wildlife populations when added to other regional transportation projects. A minor short-term regional disturbance and displacement of wildlife could occur from the combined effect of Road rehabilitation work and timber salvage and reclamation work at the Moose fire location in Flathead National Forest. Other reasonably foreseeable developments and construction projects within the Park would have a minor to moderate cumulative effect on wildlife when these activities are overlapping in time or location. Impacts to wildlife would be limited because all planned projects would occur within or adjacent to existing facilities and visitor service zones that currently have concentrated areas of human activity. Increased visitor activity from the Lewis & Clark Bicentennial Commemoration and

GNP Centennial, in addition to Road rehabilitation and visitor use improvements, could have a minor short-term effect on wildlife from additional traffic, backcountry hiking, and visitor activity throughout the Park.

Conclusion

Rehabilitation of the Road would result in minor to moderate direct short-term impacts to wildlife habitat during construction for all alternatives. Some wildlife is likely to be displaced because of the noise, human activity, and disturbance associated with roadwork. Night construction and artificial lighting primarily for Alternatives 2, 3, and 4 would result in moderate short-term effects to wildlife foraging, movement, and behavior. The loss of wildlife habitat would be minor and long term for all alternatives from Road rehabilitation because work would be confined primarily to the existing Road prism. Additional minor short-term disturbances to wildlife would occur from implementation of visitor use improvements for Alternatives 3 and 4, but these would generally occur at the same time as other Road rehabilitation work. A minor long-term loss of wildlife habitat would occur for Alternatives 3 and 4 from construction of transit staging parking near Apgar, construction of short trails, and improvements at pullouts, and the addition of slow-moving vehicle pullouts. There would be a moderate long-term impact to wildlife from implementation of the Baring Creek Cabin Trailhead and Logan Pit developments for Alternatives 3 and 4. Mitigation measures would be implemented for all alternatives that would minimize adverse effects to wildlife.

There would be no major adverse impact to wildlife whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Aquatic Resources

Methodology for Aquatic Resource Effects

Determination of effects to aquatic resources from alternative actions is difficult to quantify. Impacts are not readily measured or observable. Potential impacts to aquatic resources were based on the potential for direct disturbance to habitat or the introduction of sediments or other contaminants into streams and lakes. Beneficial effects of proposed drainage improvements were estimated based on the potential to reduce erosion and stream sedimentation. The extent of the impact was based on the knowledge of Park aquatic biologists.

Effects Common to All Alternatives. All of the alternatives would result in construction-related disturbances adjacent or in proximity to streams and lakes along the Going-to-the-Sun Road. Streams and lakes near the Road most likely to be affected include McDonald Creek, Lake McDonald, Reynolds Creek, and St. Mary Lake because these drainages parallel the Road. Potential impacts are also possible where the Road crosses streams. Direct effects may occur from ground and vegetation disturbances that increase sediment transport to water bodies. Indirect impacts may include changes in pollutant levels in water run-off, changes in downstream water quality, and disruption of natural erosion processes.

Sedimentation associated with Road rehabilitation is expected to result in adverse, minor, short-term effects to aquatic life at localized sites. Increased

sedimentation rates can negatively affect habitat for fish spawning and juvenile development and reduce the diversity and quantity of habitats for aquatic insects. Sedimentation can further stress fish species currently impacted by predation and competition with exotic species, and/or impacted by genetic dilution through crossbreeding with exotics.

Measures to minimize impact to aquatic life would be implemented at each construction zone to reduce the potential for direct or indirect impacts to aquatic species and habitat. Sedimentation would be minimized by containment of disturbed soil material within the construction zone, routing drainage around construction sites where appropriate, and other BMPs.

Proposed drainage improvements to the Road would have a minor to moderate beneficial long-term effect on aquatic resources by correcting existing drainage deficiencies, reducing erosion, and improving the quality of the water transported from the roadway. Stabilization and vegetation of eroding slopes and repairs of slumps also would have an indirect beneficial effect on aquatic resources by improving water quality. Sizing and location of culverts, where applicable, would facilitate the passage of fish, amphibians, and other wildlife using the stream corridor.

Proposed elevation of the Road or use of low water crossings near Divide Creek would have a moderate long-term beneficial impact on aquatic habitat by improving the natural flow of flood waters.

Effects of Alternative 1 (Repair as Needed). Potential impacts to aquatic resources for Alternative 1 would be the same as those common to all alternatives, except adverse and beneficial effects would be spread over 50 years. Thus, indirect adverse effects to aquatic resources from erosion and drainage deficiencies would continue and possibly become worse if rehabilitation is delayed.

Effects of Alternative 2 (Priority Rehabilitation). Potential impacts to aquatic resources for Alternative 2 would be the same as those common to all alternatives, except adverse and beneficial effects would be spread over 20 years. Thus, indirect adverse effects to aquatic resources from erosion and drainage deficiencies would continue and possibly become worse if rehabilitation is delayed.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). In addition to the impacts common to all alternatives, Alternatives 3 and 4 would result in other disturbances to aquatic resources from implementation of visitor use improvements. Proposed improvements to pullouts and parking areas at several locations adjacent to the Road would result in ground disturbances that would increase the potential for sediment entering nearby streams or lakes. Construction of additional slow-moving vehicle pullouts would have the potential to result in localized, minor short-term effects on aquatic life during construction. No adverse long-term effects to aquatic life are likely from roadside pullouts because pullouts are not located near water sources. Temporary disturbances associated with other pullout improvements may temporarily increase sediment discharges to streams or lakes, but adverse impacts are expected to be minor and short term.

Construction of a transit parking area near Apgar for Alternatives 3 and Alternative 4 would have no effect on aquatic resources because there are no nearby streams or water features. Surface runoff from parking areas would be routed to allow infiltration into adjacent soils to protect water quality. Reconfiguration of the St. Mary Visitor Center parking area to accommodate vehicles would have a negligible short-term effect because disturbance would occur within the existing parking lot.

New trail construction near water features would have the potential for indirect temporary effects on aquatic life from erosion and sedimentation. Establishment of short formal trails at Red Rock Point, Lunch Creek, Wild Goose Island Overlook, and other pullouts to replace multiple existing social trails would be a minor to moderate long-term beneficial effect on aquatic resources, by reducing soil erosion and sedimentation. Construction of a pedestrian bridge over Avalanche Creek would have a minor short-term effect on aquatic resources from incidental streambank disturbance.

Impacts to aquatic resources from construction of new toilets and rehabilitation of others would have negligible effect on aquatic life or habitat because these sites would be designed to prevent leakage to the environment. Other visitor use improvements including installation of orientation and information stations, and interpretive exhibits would have negligible short-term effects on aquatic resources.

Cumulative Effects

Cumulative effects to aquatic resources from the incremental minor effects of Road rehabilitation for all alternatives and visitor use improvements for Alternatives 3 and 4 in combination with regional transportation projects would be minor. Road rehabilitation would add a negligible short-term cumulative effect to aquatic life in addition to potential impacts associated with timber salvage or the Moose fire in Flathead National Forest along the North Fork of the Flathead River. The cumulative effect to aquatic resources from other planned roadwork and developments in the Park may result in minor short-term cumulative effects at localized sites.

Conclusion

Road rehabilitation for all alternatives would result in minor surface disturbances that could impact nearby aquatic resources. Roadwork adjacent to streams and lakes would have a minor short-term effect on localized aquatic life from the potential introduction of sediment during construction.

Improvements to visitor use facilities under Alternatives 3 and 4 would result in additional negligible to minor short-term impacts to aquatic life near construction sites. Long-term minor to moderate beneficial effects would occur from formalizing social trails near waterbodies and reducing sedimentation.

There would be no major adverse impact to aquatic life whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, the proposed action would not impair Park resources or values.

Threatened and Endangered Species and Species of Concern

Proposed rehabilitation of the Going-to-the-Sun Road, under all alternatives, would result in noise, disturbance, and habitat impacts that could affect federally listed threatened and endangered species protected under the Endangered Species Act and other state species of concern. Potential effects to these species are described below.

Methodology for Threatened and Endangered Species and Species of Concern Effects

Potential effects to federally listed threatened and endangered species and other species of concern were based on available data for these species in the Park, the anticipated loss or disturbance of habitat, and the indirect effect to species activity and behavior. Impacts to wildlife are not readily measured or observable, thus impact determinations are based on the professional judgment of Park biologists, informal consultation with the FWS, and inference from other studies. Potential impacts to plant species of concern were based on previous surveys conducted in the Road corridor and the knowledge of Park botanists on species distribution. Future plant surveys would be conducted prior to each phase of construction to determine potential effects and incorporate mitigation measures. A determination of the potential effects to threatened and endangered species will be included in the Biological Assessment to be prepared concurrent with the Final Environmental Impact Statement.

Bald Eagle—Threatened

Effects Common to All Alternatives. Rehabilitation of the Road would have a minor short-term effect on bald eagle nest sites located on Lake McDonald and St. Mary Lake. There would be no loss of nesting or foraging habitat, but noise and disturbance from construction activity near these lakes could alter foraging activity and roosting near the Road. Rehabilitation work near bald eagle territories is less extensive and would take less time to implement than repair work at higher elevation portions of the Road. Night construction and the timing of construction near bald eagle nest sites would be restricted to minimize effects, including avoidance of construction activities near eagle foraging site near Lake McDonald during the critical use dates from March 1 to May 15, and up to June 15 for the site near St. Mary Lake. Road rehabilitation work would have negligible, short-term effect on annual bald eagle migration through McDonald Valley.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). Effects to bald eagles would be the same as those common to all alternatives. Road rehabilitation would have a minor short-term effect on bald eagle foraging activities near Lake McDonald and St. Mary Lake.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Implementation of visitor use improvements would add slightly to the levels of disturbance and human activity along the Road. No direct loss or impact to nesting or foraging habitat would occur, but construction-related disturbance and human activity could affect bald eagle foraging and movement. The construction of additional visitor use facilities, including improvements at parking sites, pullouts, trails, toilets, picnic sites, and other visitor orientation, information, and interpretive features would be within the existing Road corridor and in most instances would be constructed at the same time as Road rehabilitation work. Construction of visitor use improvements would have a minor short-term effect on bald eagles.

Grizzly Bear —Threatened

Effects Common to All Alternatives. Habitat for grizzly bears is located throughout the Going-to-the-Sun Road corridor. Rehabilitation of the Road would result in a minimal direct loss of grizzly bear foraging habitat and no loss of denning habitat, since the majority or work would be conducted within the existing Road prism. No impact to the existing connectivity of grizzly bear habitat would occur because there would be no change in Road width

except for short segments of pullouts for slow-moving vehicles. The extension of construction activities into the fall may affect grizzly bear selection or use of denning sites near the Road. No roadwork would be conducted in the winter during bear hibernation and bears typically leave their den sites in the spring prior to when construction would begin.

Construction activity could temporarily displace bears from construction zones near the Road, particularly in areas where night work is conducted. Because grizzlies are often active at night, their use of foraging habitat near the Road may be altered near work zones. Typically, grizzly bears avoid areas of human activity; however, they are attracted to food, the scent of some petroleum products, and human waste. As a result, increased habituation of bears is possible from successive years of construction work and human presence along the Road. This can lead to increased incidences of human/bear contact and conflicts that can ultimately result in the removal or death of bears. Management measures would be implemented to minimize the potential for bear/human conflicts during construction, including strict policies for construction crews on the storage and disposal of food, construction materials, petroleum products, human waste, and other possible attractants.

Overall, rehabilitation of the Road is expected to have minor to moderate, short-term adverse effects on grizzly bears for all alternatives. Direct impacts to habitat would be negligible to minor, but indirect effects on grizzly bear behavior, foraging patterns, and movement could be moderately adverse during construction.

Effects of Alternative 1 (Repair as Needed). Completion of Road rehabilitation work over 50 years would introduce continuous annual construction activity. Work zones would be smaller than for alternatives that complete the work sooner, but the continued presence of construction activity over a long period could increase the potential for grizzly bear habituation of human activity. This would have a minor to moderate, long-term adverse effect on grizzly bears within the Park.

Effects of Alternative 2 (Priority Rehabilitation). Impacts to grizzly bears for Alternative 2 would be similar to those for Alternative 1. Minor to moderate, long-term adverse effects to grizzly bears are possible from implementing Road rehabilitation work over 20 years.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). These alternatives would introduce additional construction-related disturbance to the environment from implementation of visitor use improvements. A minor long-term loss of grizzly bear habitat would occur from parking and pullout improvements, transit staging area parking, trail construction, toilets, and other small disturbances. Construction of the Baring Creek Cabin Trailhead would result in long-term moderate impacts to grizzly bears by adding human activity to a relatively little used site between two existing hubs of activity, Baring Creek/Sunrift Gorge and Sun Point. Terrain features, sighting records and evidence of bear use at the site suggest this is a natural foraging and travel area for grizzlies. The existence of developed sites on either side likely increases the value of the area as a crossing site from the basin above to the lakeshore below the road. The addition of connector trails in the area would further impact grizzly bears in this narrow corridor, through displacement, habituation, and risk of human-bear encounters.

Improvements would typically be implemented during the same time that Road rehabilitation work is being done for a particular location, so a substantial increase in noise or human activity above

that common to all alternatives is not expected. The expansion of transit service to seven transit vehicles for Alternative 3 and 14 for Alternative 4 would have a negligible beneficial effect on grizzly bear activity near the Road by reducing traffic. The Shared Use and Accelerated Completion alternatives would have a moderate, short-term adverse effect on grizzly bears during construction, and a moderate, long-term adverse effect from new parking areas at Baring Creek Cabin and Logan Pit.

Gray Wolf —Endangered

Effects Common to All Alternatives. No gray wolf denning or occupancy is known in the Going-to-the-Sun Road corridor, although pack activity has been observed in the lower Middle Fork of the Flathead River drainage, the lower McDonald Valley, and St. Mary Valley. Rehabilitation of the Road for all alternatives would have no direct effect on existing pack territories. Should new packs become established or existing packs expand their range near the Road, rehabilitation work could affect wolf activity and the availability of prey species such as elk and deer. The implementation of roadwork could also deter wolves from expanding their range because they typically avoid humans and high use areas near roads. Night construction may alter wolf activity near construction zones. Road rehabilitation would have an indirect minor short-term effect on wolf activity near the Road during construction for all alternatives.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). Implementation of Road rehabilitation over 50 years for Alternative 1 or 20 years for Alternative 2 would result in less annual construction work, but extension of the work over a longer time. Potential effects on wolf activity from small annual disturbances over a long period compared to more extensive disturbance over a shorter period is difficult to predict. Each of these alternatives is expected to have an indirect minor short-term effect on wolf activity near the Road during construction.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Proposed visitor use improvements for these alternatives would add construction disturbance and human activity at pullouts, oversized vehicle turnarounds, toilets, and other facilities. Minor long-term direct loss of wolf or prey habitat would occur with construction of transit parking, new pullouts, and trails.

Similar to Road rehabilitation effects, visitor use improvements would have an indirect minor short-term effect on wolf activity near the Road during construction and from continued human activity at these sites. Construction of new short trails adjacent to the Road would add additional human activity into the natural environment, but trails would be limited to existing visitor use zones to minimize potential effects.

Lynx —Threatened

Effects Common to All Alternatives. Lynx distribution and presence in the Park is not well known, but suitable forest habitat is present along the Going-to-the-Sun Road. Rehabilitation work on the Road would result in a negligible direct loss of suitable lynx foraging habitat with no loss of lynx denning habitat. Potential minor short-term effects to lynx are more likely to occur from construction activity, noise, and human presence during construction. The Road width would remain the same and hence, no additional barriers to lynx movement or disruption in the connectivity of habitat would occur. Night construction may displace lynx foraging near work sites. There would be no effect to lynx in the winter.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). Implementation of Road rehabilitation under Alternatives 1 and 2 would extend work over a longer period of time. The effect of small annual construction disturbances on lynx activity is not known, but may result in minor to moderate short-term displacement of lynx activity near the Road.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Implementation of visitor use improvements for these alternatives would result in a negligible long-term loss of lynx foraging habitat. Habitat loss would be located near the existing Road and visitor use facilities that are unlikely to provide essential components to lynx habitat requirements, and the connectivity of lynx habitat would be maintained. There would be no loss of denning habitat. Human activity associated with visitor use improvements may have a negligible to minor long-term effect on lynx movement or activity near these sites because improvements are located near existing areas of human activity.

Construction of less than 1 mile (1.6 kilometers) of new trails could affect lynx or prey activity near the trails, but trails would be located within existing visitor use zones near the Road to minimize effects. Expansion of transit service for Alternatives 3 and 4 would slightly reduce the number of private vehicles and the potential for lynx/vehicle collisions. Construction of a transit staging area near Apgar would result in a minor long-term loss of forest habitat, but because of its proximity to the Road, this facility is unlikely to affect lynx foraging or movement.

Bull Trout —Threatened

Effects Common to All Alternatives. Rehabilitation of the Going-to-the-Sun Road for all alternatives would result in soil disturbances, erosion, and sedimentation of streams and lakes. Minor short-term impacts to bull trout and their habitat would occur at localized construction sites both east and west of the Continental Divide. Potential direct effects would primarily occur where the Road parallels or crosses Lake McDonald, McDonald Creek, St. Mary Creek, St. Mary Lake, and Divide Creek, and where the Road crosses tributaries. Erosion and sediment control measures would be used to capture sediment on site and prevent introduction into water bodies. Indirect adverse effects to bull trout from long-term construction-related improvements would be minor following revegetation of disturbed areas. A minor long-term beneficial improvement to bull trout would occur throughout the Road corridor from improvements in Road drainage that reduce erosion and sedimentation.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). Potential impacts to bull trout for Alternative 1 and Alternative 2 would be the same as those common to all alternatives, except adverse and beneficial effects would be spread over 50 and 20 years, respectively. Thus, indirect adverse effects to aquatic resources from erosion and drainage deficiencies would continue and possibly become worse if rehabilitation is delayed.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Proposed improvements to pullouts and parking areas at several locations adjacent to the Road would result in ground disturbances that would increase the potential for sediment entering nearby streams or lakes. Construction of a pedestrian bridge over Avalanche Creek would have a minor short-term effect to bull trout habitat from incidental streambank disturbance.

Construction of additional slow-moving vehicle pullouts along Lake McDonald and St. Mary Lake has the potential to result in localized minor short-term effects on bull trout during construction. No adverse long-term effects to aquatic life are likely from roadside pullouts.

Construction of short new connector trails near the Road and visitor developments have the potential for indirect effects to bull trout from erosion and sedimentation. Adverse effects would be short term and negligible. Establishment of short formal trails at Red Rock Point, Logan Creek, and other pullouts to replace multiple existing social trails would be a minor long-term beneficial effect to bull trout by reducing soil erosion and stream sedimentation.

New and rehabilitated toilets would be designed to contain all waste and prevent the introduction of pollutants into the aquatic environment. As a result, there would be no effect on bull trout. Other visitor use improvements including installation of orientation and information stations, interpretive exhibits, and construction of the transit system parking would have negligible short-term effects on aquatic resources for both Alternatives 3 and 4.

Wildlife and Plants —Species of Concern

There are 63 wildlife and aquatic species of concern and 64 plant species of concern within the Going-to-the-Sun Road corridor (Appendix C). Suitable habitat for several of these species is known to occur in close proximity to the Road and potential species or habitat effects are possible from rehabilitation work for all alternatives. In general, wildlife species of concern could be temporarily displaced or disturbed during construction. Potential direct effects to wildlife of special concern or their habitat would be minor because most work would occur within the existing Road prism. Direct effects to plant species of concern are possible, and future surveys would be conducted to evaluate site-specific effects.

Effects Common to All Alternatives.

Rocky Mountain Bighorn Sheep and Mountain Goats. Proposed Road rehabilitation would have a minor to moderate short-term effect on bighorn sheep and mountain goats present along the cliffs between The Loop and Logan Pass. Construction activity throughout the spring, summer, and fall may displace sheep and goat activity near the Road; however, many of these animals have become acclimated to traffic and human activity. The timing of construction activities, including night work, would be modified at some locations to minimize potential effects.

Golden Eagle. The noise and disturbance associated with Road rehabilitation would have a moderate short-term effect on golden eagle nest sites between Avalanche and Logan Pass. There would be no direct loss of habitat, but eagles could be displaced by construction-related noise. However, golden eagles are tolerant of existing traffic and noise during the summer. A negligible to minor short-term effect on annual migratory golden eagle movement through the Park would occur from Road rehabilitation.

Harlequin Duck. Suitable harlequin duck habitat throughout the McDonald and St. Mary valleys is in proximity to the Road. Rehabilitation work on the Road is not expected to directly degrade riparian and river habitat used by harlequin ducks. Because harlequins typically seek breeding habitat away from human disturbance, additional human activity and noise could displace ducks from some construction locations and reduce available nesting and brood-rearing sites. This may affect the number of young produced, especially on McDonald Creek. Harlequin duck use of McDonald Creek near the Logan Pit staging areas also could be affected by

additional construction activity at this site and over the long term from human activity at the oversized vehicle turnaround. At least one nesting pair has a territory in the vicinity of Logan Pit and additional brood rearing by more than one female occurs in this area. Potential impacts during and after construction could cause abandonment of a nest site and displacement from foraging and brood rearing habitat. A vegetation buffer would be maintained between the creek and the staging area/turnaround to minimize impacts, but if visitor use near McDonald Creek increases, the value of this site for harlequin duck use would be reduced. Overall, a moderate long-term effect to harlequin duck would occur from staging activities and use of Logan Pit for parking and an oversized vehicle turnaround.

Wolverine. Wolverine are wide ranging species that may visit a wide variety of forest and subalpine habitats near the Road, including ungulate winter range sites in search of carrion in the winter. Because wolverine typically avoid areas of human activity, proposed construction work, particularly at night, may displace wolverine activity near the Road. This is expected to have a moderate short-term effect on wolverines during construction.

Fisher, Northern Goshawk, Pileated Woodpecker, Hammond's Flycatcher, Winter Wren, Brown Creeper, Great Gray Owl, Vaux's Swift, Olive-Sided Flycatcher, Three-toed Woodpecker, Northern Hawk Owl, Silver-haired Bat, Boreal Owl, Clark's Nutcracker, and Ruffed Grouse. There would be no loss of the old forest that these species prefer. Construction-related disturbances may result in a minor short-term displacement near the Road.

Northern Bog Lemming, Willow Flycatcher, Black Tern, Black-crowned Night Heron, and LeConte's Sparrow. Disturbance to wet meadows, bogs, riparian, and marsh borders would be avoided. As a result, Road rehabilitation would have negligible to minor short-term effects on these species.

White-tailed Ptarmigan. No loss of alpine habitat is expected and impacts to ptarmigan would be negligible to minor and short term.

Ferruginous Hawk, Lark Bunting, McCown's Longspur, Marbled Godwit, Chestnut Collard Longspur, and Swift Fox. Disturbance to grasslands and shrublands used by these species would be slight. Potential impacts from Road rehabilitation would be negligible and short term.

Common Loon, Barrow's Goldeneye, and Hooded Merganser. These species require streams, riparian forests, and lake habitats. Disturbance from construction activity would have a minor short-term effect on breeding or productivity because of the minimal disturbance of primary habitat.

Hoary Bat, Townsend's Big-eared Bat, Black-Backed Woodpecker, Cordilleran Flycatcher, and Williams Sapsucker. Minimal disturbance would occur to the mixed montane and riparian forests that these species prefer. Road rehabilitation would result in minor short-term effects to these species.

Trumpeter Swan, Long-billed Curlew, Common Tern, Forster's Tern, Franklin's Gull, Caspian Tern, Horned Grebe, and American White Pelican. Lakes, ponds, rivers, and streams provide staging during migration for these species. A minor short-term negative effect to these species is possible if construction related disturbance deters migration stopovers.

Veery and Red-Eyed Vireo. Potential impacts to these species would be negligible to minor and short term because there would be no loss of riparian old deciduous forest.

Loggerhead Shrike. Minor short-term effects to this species are likely because of the minimal disturbance to sagebrush and upland woodlands.

Lewis's Woodpecker. Construction-related disturbance would have minor short-term effects to Lewis woodpecker and there would be no loss of low elevation, early seral, burned forests preferred by this species.

Lazuli Bunting and Calliope Hummingbird. Impacts to these species would be minor and short term with minimal disturbance to suitable breeding habitat in early seral montane and lower montane, shrub-dominated communities.

Brewer's (Timberline) Sparrow. Disturbance to subalpine shrubs and krummholz habitat preferred by this species would be minimal. Potential impacts from rehabilitation would be minor and short term.

Peregrine Falcon and Black Swift. No cliff habitat suitable for these species would be affected. Construction activity would have a minor short-term effect.

Boreal Toad and Tailed Frog. Disturbance to the aquatic habitats used by these species would be avoided during Road rehabilitation. Adverse effects are expected to be negligible to minor and short term.

Shorthead Sculpin, Spoonhead Sculpin, Trout-perch, and Western Cutthroat Trout. Potential direct effects would occur where the Road parallels or crosses Lake McDonald, McDonald Creek, St. Mary Creek, St. Mary Lake, and Divide Creek. Potential temporary introductions of sediment would have a minor short-term effect.

Rocky Mountain Capshell. No disturbance to lake or pond habitat is anticipated from Road rehabilitation that would affect this species. Negligible short-term effects are possible during construction.

Plant Species of Concern. Detailed surveys for plant species of concern have not been conducted for the entire Going-to-the-Sun Road project area. Previous surveys of the Lake McDonald Lodge and the Rising Sun Development areas near the Road did not locate any plant species of concern. Surveys near Apgar have located the state rare velvet-leaf blueberry (*Vaccinum myrtilloides*). Prior to initiating rehabilitation work, field surveys would be conducted to identify plant species of concern that could be affected by roadwork. Should species of concern be located, barriers or other measures would be used to protect plant populations from inadvertent disturbance. If plant species of concern cannot be avoided, direct long-term effects are possible to individual plants. The intensity of the impact to the population of a particular species would be identified prior to construction, but efforts would be made to limit population impacts to a minor level.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). No impacts other than those common to all alternatives were identified.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). The disturbances associated with implementation of additional visitor use improvements would have impacts to wildlife and plant species of concern similar to that described for all alternatives. Because the majority of improvements would occur adjacent to the Road and would be implemented during Road rehabilitation, substantial additional impacts are not anticipated. Adverse effects to wildlife are expected to be negligible to minor and short term; however, moderate short-term effects to Rocky Mountain bighorn sheep, mountain goat, golden eagle, harlequin duck, and wolverine are possible. A population of a plant species of concern—velvet-leaf blueberry (*Vaccinium myrtilloides*)—is located near the proposed transit staging area at Apgar. The parking facility would be located to avoid this species; however, if avoidance is not possible, there would be a direct loss of individual plant species,

and a minor to moderate short-term effect to the overall velvet-leaf blueberry population.

Construction of short new trails and rehabilitation of social trails would have a minor long-term effect on wildlife species of concern, although trails would be located within existing visitor service zones to minimize impacts. Surveys for plant species of concern would be conducted prior to final trail placement to avoid potential impacts.

Cumulative Effects

Cumulative effects to threatened and endangered species, and species of concern are possible for all alternatives. Regional development and roads have contributed to habitat fragmentation. Reasonably foreseeable roadwork planned for areas outside of the Park could coincide with rehabilitation work on the Road. The cumulative effect of multiple road projects is expected to have a minor effect on habitat because transportation work would occur within existing road corridors; however, a minor short-term disturbance or displacement of species is possible. Forest Service salvage operations at the Moose fire also may result in a temporary displacement of threatened and endangered species or species of concern, but the incremental effect of proposed Road rehabilitation would add only a minor short-term impact to these species.

Other planned roadwork in the Park and potential future improvements to Park facilities would introduce additional disturbance. The cumulative effect of these activities plus proposed Road rehabilitation would result in a minor short-term cumulative effect on threatened and endangered species and species of concern from displacement. Special events including the Lewis & Clark Bicentennial Commemoration and GNP Centennial are likely to increase visitation, possible backcountry travel and indirectly affect threatened and endangered species and species of concern for all alternatives. Similar effects are possible from general population growth, although Park visitation is projected to remain level.

Conclusion

For all alternatives, there would be a negligible to minor direct short-term impact on wildlife habitat used by threatened and endangered species or species of concern from incidental construction disturbance. There would be no effect to threatened or endangered plant species because there are no known populations in the Park. Alternatives 3 and 4 would attempt to avoid disturbance to velvet-leaf blueberry, a plant species of concern located near the proposed transit staging area at Apgar.

The noise, disturbance, and human activity associated with Road rehabilitation and implementation of visitor use improvements for Alternatives 3 and 4 may affect several threatened and endangered species and species of concern. Minor short-term effects to bald eagle foraging are possible near Lake McDonald and St. Mary nest sites. Grizzly bear activity near the Road could be displaced or an increase in human/bear conflicts is possible from rehabilitation work in the fall and at night. This could result in minor to moderate short-term effects to grizzly bears. Visitor use improvements for Alternatives 3 and 4 would result in a minor long-term loss in grizzly bear habitat. The Shared Use and Accelerated Completion alternatives would have a moderate, short-term adverse effect on grizzly bears during construction, and a moderate, long-term adverse effect from new parking areas at Baring Creek Cabin and Logan Pit. Although gray wolf territories are not presently in the project area, additional noise and disturbance during construction could deter expansion of their range. A minor short-term effect to lynx foraging

near the Road is possible from additional human activity. Minor short-term effects to bull trout and/or their habitat is possible from the introduction of sediment during proposed work.

Moderate short-term effects to several wildlife species of concern would occur from rehabilitation related disturbances. Rocky mountain bighorn sheep and mountain goats between The Loop and Logan Pass would be disturbed by construction activity. Potential disturbance to golden eagle nesting is possible in the Avalanche to Logan Pass area. Wolverine activity near the Road may be affected by rehabilitation work particularly where night work is conducted. Harlequin duck breeding sites adjacent to the Logan Pit staging area and other streamside areas may be displaced by construction staging activities and, over the long term, by use of the site for parking and an oversized vehicle turnaround. .

There would be no major adverse impact to threatened and endangered species or species of concern whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Air Quality

Methodology for Air Quality Effects

Impacts to air quality were qualitatively estimated based on the anticipated emissions associated with Road rehabilitation and visitor use improvements. No quantitative modeling of air quality effects was deemed necessary because all impacts are expected to be minor and short-term.

Effects Common to All Alternatives. All of the alternatives would have similar types of effects on air quality. In the short term, truck and equipment traffic and activity would increase dispersed dust and mobile exhaust emissions. Dust emissions are expected to be minor because of the limited excavation and soil exposure that would be needed for most work. Increased dust and emissions would occasionally be visible from the Road depending on the type of rehabilitation work being conducted. Additional dust would be generated if concrete batch plants are located at the Logan Pit or Sun Point staging areas. Dust from construction sites or staging areas may be visible from the Road and other nearby locations. The increased dust and emissions would occur during the construction period and would cease after construction is completed. Dust abatement measures would be implemented to minimize airborne particulates. Road rehabilitation is not expected to result in increased traffic or vehicle emissions after the construction period. A temporary local increase in pollutants would not result in exceedances of applicable air quality standards.

Effects of Alternative 1 (Repair as Needed). Air quality emissions from rehabilitation work would occur annually over 50 years. Emissions are expected to have a negligible to minor short-term effect on air quality or visibility. Because work conducted each year would be in relatively short segments of the Road, substantial dust and vehicle emissions are unlikely.

Effects of Alternative 2 (Priority Rehabilitation). Air quality emissions would be similar to Alternative 1, with minor short-term emission and visibility impacts near construction sites over 20 years. Operation of three additional transit vehicles would have a negligible beneficial effect on air quality by reducing the number of private vehicles

traveling through the Park and overall vehicle emissions.

Effects of Alternative 3 — Preferred (Shared Use). Implementation of rehabilitation work over 7 to 8 years would require multiple construction sites and increase the potential for generating dust and emissions over a longer portion of the Road. Potential impacts to air quality and visibility are expected to be minor and short term at localized sites.

Proposed visitor use improvements such as the addition of slow-moving vehicle pullouts and scenic pullouts, and upgrades to parking and pullouts would require the use of heavy equipment and some soil disturbance that would generate increased vehicle emissions and particulate dust. Impacts to air quality from these activities would have a minor short-term effect on air quality and would not exceed air quality standards. The expansion of a transit bus transit system to seven vehicles would have a minor beneficial effect on air quality by reducing private vehicle travel and associated emissions. Other proposed visitor use improvements would have a negligible effect on air quality.

Effects of Alternative 4 (Accelerated Completion). Impacts to air quality would be similar to Alternative 3, except that dust and emissions would occur over a slightly shorter period (6 to 8 years). Potential impacts to air quality and visibility are expected to be minor at localized sites. Further expansion of a transit bus transit system to 14 vehicles would have a minor beneficial effect on air quality by reducing private vehicle emissions.

Cumulative Effects

The dust, emissions and potential impacts to visibility from rehabilitation work on the Road for all alternatives would have a negligible to minor short-term effect on regional air quality when added to the similar types of emission from other transportation projects outside of the Park. Minor short-term effects to air quality in the Park would occur from rehabilitation and visitor use improvement-related emissions in addition to other planned roadwork and facility improvements in the Park. A minor short-term impact on air quality is possible with increased visitation and traffic during the Lewis & Clark Bicentennial Commemoration and Park Centennial Celebrations.

Conclusion

Minor short-term impacts to air quality and visibility would occur for all alternatives from construction vehicle emissions and dust generation by rehabilitation work on the Road. Similar levels of impact would occur from implementation of visitor use improvements for Alternatives 3 and 4. Expansion of transit service for Alternatives 2, 3, and 4 would provide minor, long-term, beneficial effects to air quality by slightly reducing the number of vehicles and associated emissions.

There would be no major adverse impact to air quality whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, the proposed action would not impair Park resources or values.

Visual Quality

Methodology for Visual Quality Effects

The EIS analysis of Going-to-the-Sun Road visual issues was based primarily on a comprehensive

Cultural Landscape Report for the Road completed in 2002 (RTI 2002). This study examined the overall landscape qualities of the Road, identifying important and characteristic vistas and visual qualities. Information on the visual landscape of the Road was evaluated in conjunction with Road rehabilitation and design data contained in the *Engineering Study* completed for the Road in 2001 (WIS 2001a). Recently completed Road rehabilitation projects were also examined, to gauge the impact of such projects on the visual qualities of the Road.

Effects Common to all Alternatives

As discussed in Chapter 3, the visual landscape of the Going-to-the-Sun Road includes varied views both of the Road and from the Road; visual opportunities may also be characterized as either short-range or long-range views. Future Road rehabilitation projects are likely to impact these various visual qualities in differing ways. Visual impacts to the roadway corridor would be broadly similar for all alternatives. Precise visual impacts would vary somewhat depending on the specific project design chosen, and on construction methods employed.

Regardless of the alternative chosen, both short-term and long-term impacts would be expected. Short-term impacts would generally be adverse, falling into one of two broad categories:

- Impacts caused by Road rehabilitation projects; and
- Impacts resulting from the delay of needed Road rehabilitation.

Short-term visual impacts caused by Road rehabilitation projects would occur primarily within the roadway corridor itself, affecting short-range views both of and from the Road. Most would be negligible or minor in scope. Specific short-term visual impacts would include:

- Construction equipment and crews at specific work sites, and traveling along the Road;
- The temporary removal or covering of historic stonework or other features during rehabilitation; and
- The temporary use of equipment staging areas and/or material stockpile sites.

Visible damage to the historic structural and engineering features of the Road currently impacts the visual landscape of sections of the Road corridor. Particularly on the Alpine portions of the Road, short-range views are diminished by extensive areas of damage that have impacted stone guardwalls, retaining walls, and other features. Due to a lack of resources, the NPS has been unable to fully repair much of the damage that has occurred. Instead, concrete "jersey barriers" and other temporary protective measures have been installed in some locations; almost always, these stopgap measures are incompatible with the historic visual character of the Road corridor. Other damaged areas have been only partially repaired, or have been repaired using modern materials. In many locations, these repairs and temporary protective measures are prominent visual intrusions. The visual impact of these intrusions is generally minor to moderate in scope, and will continue until Road rehabilitation is completed. Meanwhile, the effects of continuing deterioration and damage of historic resources will become increasingly apparent along non-rehabilitated segments of roadway.

Nearly all visual impacts would be limited to the immediate Road corridor, impacting short-range views. Staging and material storage areas beyond the Road corridor would also be required; however; depending on their locations, these areas may be

visible either from the Road or from other vantage points. Adequate planning for the reclamation of these sites would limit their visual impact to a short duration.

Long-term impacts have the potential to be both adverse and beneficial. Adverse long-term impacts would largely be avoided with appropriate project designs. Moderate to major beneficial long-term impacts would result from the rehabilitation of deteriorated roadway engineering features, as well as from the removal of non-historic and visually intrusive features.

Effects of Alternative 1 (Repair As Needed). Visual impacts for Alternative 1 would include both the effects of construction projects and the visual degradation caused by the delay of needed repairs. Impacts caused by Road rehabilitation work would include those described as common to all alternatives. Because repair work would be piecemeal, and programmed in response to incidents of Road damage, visual intrusions would likely be apparent along the upper reaches of the Road annually, for an extended period of years. The precise impacts would be dependent on the nature of specific projects undertaken, and would vary from project to project and year to year. Impacts would be minor to moderate, although an unforeseen, catastrophic Road failure could result in a major impact.

Under Alternative 1, additional short-term adverse visual changes to the immediate Road corridor also would result as the roadway continues to deteriorate, causing further damage and the need for subsequent repairs. This alternative would extend the period in which visually intrusive temporary protective measures are present.

Overall, Alternative 1 would result in the greatest visual impact to the roadway corridor, since the duration of the rehabilitation work would be extended over 50 years and the cultural and visual resources in the roadway corridor would continue to degrade during that time.

Effects of Alternative 2 (Priority Rehabilitation). Alternative 2 would produce visual impacts similar to those described under Alternative 1, but because the rehabilitation period would be reduced to 20 years, the duration and severity of the impacts would diminish slightly. Coordinated planning of the overall rehabilitation process would allow for implementation of repairs to specific segments of roadway during individual construction seasons, although some disturbances (such as construction traffic) would be apparent throughout much of the roadway length. The specific nature of rehabilitation projects – and their visual impacts – would vary from year to year. Construction-related visual impacts would be short-term, and most would be minor in scope.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Visual impacts under Alternatives 3 and 4 would be similar in type to those found under Alternative 2, but the duration and scope of the effects would differ. The accelerated construction schedules of Alternatives 3 and 4 would reduce the duration of visual intrusions caused by prior Road damage, while simultaneously reducing the likelihood of current or future damage. Construction-related visual impacts would be of a shorter overall duration, but would likely be more pronounced while in place. As with Alternative 2, careful project planning would help minimize these impacts. All impacts would be short-term in duration, and minor to moderate in scope.

In addition to roadway rehabilitation, Alternatives 3 and 4 call for the development of improved visitor facilities – including toilets, improved pullouts and parking, and other features – at several key locations

along the Road. The construction of these improvements would create minor, short-term impacts similar to those caused by roadway rehabilitation work. The addition of these visitor use improvements would also result in some long-term impacts. The development of additional, non-historic structures and facilities on the Road would create a minor, adverse visual effect. This would be partially offset by visual improvements resulting from improved traffic flow and lessened visual clutter. Long-term beneficial effects to visual quality would occur from rehabilitation of social trails, upgrades to existing pullouts, and improvements in visitor orientation and information facilities.

Cumulative Effects

Other Road improvements, developments, and planned activities in the Park may also affect visual resources in and near the Road corridor. If the Park's CSP is implemented, this may result in short-range visual impacts near the Road at the developed areas of Apgar, Lake McDonald, and Rising Sun. Some of the additional visitor use improvements outlined in Alternatives 3 and 4 would occur within these developed areas.

Because nearly all of the adverse visual impacts of the proposed Road rehabilitation would be short term, rehabilitation would have a negligible cumulative effect on visual resources. The additional visitor use improvements specified in Alternatives 3 and 4, when added to other actions, would have only a minor cumulative effect on visual resources.

Conclusion

Road rehabilitation for all alternatives would result in minor to moderate, short-term adverse effects to visual resources during the period of construction. The coincident repair of deteriorated roadway structural features, however, would result in a moderate to major beneficial effect to visual resources over the long term. The proposed visitor use improvements in Alternatives 3 and 4 would create a minor, long-term visual impact. Negative, short-term visual impacts are greatest for Alternative 1, and would be lowest for Alternatives 3 and 4. Long-term visual benefits would be seen from all alternatives, but would be realized most quickly in Alternatives 3 and 4.

There would be no major adverse impact to visual resources whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, the proposed action would not impair Park resources or values.

Natural Soundscape and Lightscape

Methodology for Soundscape and Lightscape Effects

Potential impacts to the natural soundscape and lightscape within the Park associated with proposed rehabilitation work were evaluated based on the anticipated noise and light typical for similar types of construction work previously conducted in the Park and other regional roads.

Effects Common to All Alternatives. Rehabilitation of the Going-to-the-Sun Road would introduce noise and artificial light into the Park during construction. Noise would be generated by construction equipment, machinery, work vehicles, and additional human activity in work zones and

could occur from spring to fall both day and night. Noise would be loudest near the point of generation and would decrease with distance from the source. Noise from truck traffic would extend outside of the Park from delivery of construction material and work crews. Night construction activities would introduce artificial lights at work sites, which would brighten the night sky.

Noise from construction activity would have a minor to moderate short-term effect to the natural quiet typically present in the Park. However, roadwork would be conducted along the existing Road where noise from traffic is common. Elevated noise levels may affect the quality of the visitor experience as well as wildlife activity near the Road. Various measures would be used to minimize construction-related sounds including conducting heavy equipment operations during daylight hours, equipping construction equipment with adequate mufflers, and scheduling work activities to avoid early morning or night work near lodges, campgrounds, and sensitive wildlife habitats.

Artificial night lighting to conduct rehabilitation activities would result in a minor to moderate short-term impact on the night sky in the Park. Illumination of work zones may alter wildlife behavior and deter their normal night activity. In addition, the quality of the visitor experience may be diminished by artificial light in a normally dark sky. Night work would not be conducted near lodges and campgrounds and work zones would be limited to small-localized areas to minimize impacts to visitors and wildlife.

Effects of Alternative 1 (Repair as Needed). Night work may be necessary for the Repair as Needed alternative, but is less likely than for other alternatives. Should a catastrophic Road failure occur night work may be needed to repair the roadway as quickly as possible.

Effects of Alternative 2 (Priority Rehabilitation). As with Alternative 1, night work may be necessary to complete rehabilitation work, but because less work would be done per given year, the need for night work is less likely.

Effects of Alternative 3 (Shared Use) and Alternative 4 (Accelerated Completion). Night work would be used during Road rehabilitation for certain tasks primarily at lower elevation sites subject to safety requirements. The visitor use improvements included in Alternatives 3 and 4 would result in additional noise and disturbance during construction and implementation. It is anticipated that none of the visitor use improvements associated with Alternatives 3 and 4, such as pullouts and parking, would be constructed at night, so there would be no effect on the night sky within the Park. The noise and disturbance during implementation of improvements to pullouts, parking areas, toilets, trails and other locations would deter wildlife activity and visitor use near these sites. This would be a minor to moderate short-term effect during construction and mitigation measures similar to those described as common to all alternatives would be implemented. The expansion of the number of transit vehicles to seven for Alternative 3 and 14 for Alternative 4 would have a beneficial, minor, short-term effect by reducing the number of vehicles on the Road and the associated traffic noise. An additional noise source at the proposed Apgar and St. Mary Visitor Center transit parking areas would increase ambient noise levels during the summer from traffic and visitor activity.

Cumulative Effects

Cumulative effects from noise and artificial night lighting are only relevant for reasonably foreseeable projects located within or near the Park and would

be common to all alternatives. Other planned transportation work and future improvements to Park facilities may result in minor to moderate, short-term impacts to visitors and wildlife from the additive impact of multiple simultaneous noise sources. Project scheduling can probably be used to minimize construction activities at the same locations. Cumulative effects on the night sky would be limited to rehabilitation work, since no other planned projects within the Park would contribute additional artificial light at night.

Conclusion

A minor to moderate short-term increase in noise would occur for all alternatives during Road rehabilitation. This may disturb visitors as well as wildlife, but scheduling and other restrictions would be used to minimize impacts. Proposed additional visitor use improvements included in Alternatives 3 and 4 also would generate noise, but most improvements would be implemented at the same time and locations as other Road rehabilitation work.

Night lighting would be used primarily for Alternatives 3 and 4. The introduction of an artificial light source would have a minor to moderate short-term effect on the night sky and may affect the quality of the visitor experience and wildlife activities near the Road.

There would be no major adverse impact to natural soundscape and night sky whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

Wilderness and Wild and Scenic Rivers

Methodology used for Wilderness and Wild and Scenic Rivers

The first level of analysis for potential impacts to proposed wilderness and wild and scenic rivers near the proposed project was to determine if any direct impacts to these land classifications were anticipated. The second level of analysis was to consider if lands intended for wilderness or wild and scenic river uses would be indirectly affected during or following rehabilitation.

Effects Common to All Alternatives. None of the alternatives would result in direct disturbance or impacts to proposed wilderness or wild and scenic rivers in the Park. Noise from construction activities may carry into proposed wilderness areas that parallel the Road and would have a negligible to minor short-term effect on wilderness values. Indirect effects to the Middle Fork of the Flathead River are possible from increases in sediment discharge during rehabilitation work on the west side of the Continental Divide. Because Lake McDonald is located above the Middle Fork, it is very unlikely that water quality in the Wild and Scenic River would be affected. There would be no impact to the values for which the Middle Fork of the Flathead River was designated Wild and Scenic.

Effects of Alternative 1 (Repair as Needed) and Alternative 2 (Priority Rehabilitation). No additional effects to proposed wilderness or wild and scenic rivers were identified other than those common to all alternatives.

Effects of Alternative 3 — Preferred (Shared Use) and Alternative 4 (Accelerated Completion). Impacts to proposed wilderness and wild and scenic rivers from implementation of visitor use

improvements would be similar to those common to all alternatives. No additional direct or indirect effects were identified for Alternatives 3 and 4.

Cumulative Effects

No cumulative effects to proposed wilderness or wild and scenic river values were identified.

Conclusion

There would be no direct disturbance to wilderness or wild and scenic rivers as a result of Road rehabilitation for all alternatives, including visitor use improvements in Alternatives 3 and 4. Minor short-term indirect effects are possible from noise intrusion into the wilderness. There would be no effect on the Middle Fork Wild and Scenic River designation.

There would be no major adverse impact to wilderness or wild and scenic rivers whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation of GNP; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the GMP or other relevant NPS planning documents. Therefore, none of the alternatives would impair Park resources or values.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Effects of Alternative 1 (Repair as Needed)

Alternative 1 would not meet the present needs in such areas as infrastructure improvements and visitor management, and would not allow the Park to fulfill its mission of providing for the needs of future generations. Because of the duration of rehabilitation activity (50 years), further deterioration or loss of the historic features associated with the roadway could foreclose options for future preservation and use due to higher costs of rehabilitation. Additional environmental damage is highly possible. The costs and efficiency of repairing failed sections of roadway on a piecemeal or emergency basis would be substantially higher compared with larger scale planned rehabilitation work, which could reduce the amount of funding available for future generations.

Effects of Alternative 2 (Priority Rehabilitation)

While Alternative 2 is an improvement over Alternative 1, it would not meet the present needs in such areas as infrastructure improvements and visitor management, and could also compromise the ability of future generations to meet their needs. Some planning and design would occur ahead of time, rather than in response to Road failure or emergency repairs. Advanced planning ensures that historic cultural resources, environmental and socioeconomic concerns, and operations and maintenance issues are addressed, but

implementation of Road repairs over 20 years would allow continued deterioration or loss of these resources. Potential environmental damage, jeopardy of safety, and deterioration of historic features would be similar to Alternative 1.

Effects of Alternative 3 — Preferred (Shared Use)

Rehabilitation under Alternative 3 would take place in a shorter period (7 to 8 years) than Alternatives 1 and 2, minimizing further damage to the environment and historic and cultural resources. Immediate benefits to the resources listed above may cause short-term effects to visitor experience, due to traffic delays from a more aggressive rehabilitation schedule. The long-term productivity of the Park and use of Park resources would not be compromised, and is expected to increase because of improvements that upgrade facilities and address safety concerns. Advanced planning allows for a more efficient and cost effective rehabilitation process, which would benefit future generations.

Effects of Alternative 4 (Accelerated Completion)

Under Alternative 4, rehabilitation would be completed in 6 to 8 years, helping to prevent further damage to the environment and historic and cultural resources. The aggressive rehabilitation schedule would result in traffic suspensions during the week in construction zones and maintenance of visitor access on the weekends. The long-term productivity of the Park and use of Park resources would not be compromised, and is expected to increase because of improvements that upgrade facilities and address safety concerns. In Alternative 4, the advanced planning and traffic suspension allows for the most efficient and cost effective rehabilitation process, which would benefit future generations. However, this alternative would have an adverse economic effect during rehabilitation, but would provide for long-term sustainability of the Road and economy dependent on tourism.

Irreversible and Irretrievable Commitments of Resources

Under all alternatives, the use of land, construction materials, energy, and financial resources to implement the alternative would be an irretrievable commitment of resources.

Effects of Alternative 1 (Repair as Needed)

Deterioration or loss of resources, especially cultural and historic resources, as a result of delay of rehabilitation could be irreversible commitments of resources. No irreversible or irretrievable impacts to wetlands, aquatic resources, water quality, air quality, natural soundscape or lightscape, wilderness, or wild and scenic rivers would occur because impacts would be short term. There would be minor irreversible or irretrievable impacts to geology and topography, vegetation, wildlife habitat, soils, or threatened and endangered species or species of concern because construction would take place primarily within the existing prism. A long-term irretrievable disturbance to resources would occur adjacent to existing facilities at site-specific locations where structural components, such as additional pavement or stonework, are added. While there would be socioeconomic impacts due to project implementation, they would not be long term in nature and therefore would not constitute irreversible or irretrievable commitments of resources.

Effects of Alternative 2 (Priority Rehabilitation)

The commitment of resources for Alternative 2 would be similar to those described in Alternative 1.

Effects of Alternative 3 —Preferred (Shared Use)

Under Alternative 3, there would be no irretrievable or irreversible impacts to aquatics and water quality, socioeconomic resources, wetland resources, air quality, natural soundscape and night sky, or wilderness and wild and scenic rivers. Because any impacts to these resources would be short-term, they would not constitute irretrievable or irreversible impacts. Construction of new facilities under Alternative 3 would result in irretrievable impacts to geology and topography, vegetation, wildlife habitat, soils, and threatened and endangered species and species of concern. These could be restored upon removal of those facilities, and are therefore classified as irretrievable impacts.

Effects of Alternative 4 (Accelerated Completion)

The commitment of resources for Alternative 4 would be similar to those described for Alternative 3.

Adverse Impacts That Cannot Be Avoided

Effects of Alternative 1 (Repair as Needed)

Adverse effects as a result of continued deterioration of cultural and historic resources are unavoidable under Alternative 1. Construction activities would delay and displace visitors to the Park who travel on the Road. Impacts to soils, vegetation, and water quality as a result of continued erosion during the 50-year rehabilitation period would be unavoidable adverse impacts. Adverse economic effects are possible from reduced visitation to the Park and region due to Road rehabilitation particularly if emergency repairs are needed.

Effects of Alternative 2 (Priority Rehabilitation)

Unavoidable adverse impacts for Alternative 2 would be similar to those described for Alternative 1.

Effects of Alternative 3 —Preferred (Shared Use)

Unavoidable adverse impacts to geology and topography, vegetation, wildlife habitat, soils, and threatened and endangered species habitat would occur under Alternative 3 as a result of new facilities. These impacts would be minimized and avoided to the extent possible in final design using BMPs. Inconveniences to Park visitors who travel the Road during construction would be unavoidable adverse impacts. Adverse economic effects to the local and regional economy would occur during rehabilitation work. These impacts are largely unavoidable, but visitor development strategies and other mitigation measures would be used to minimize impacts.

Effects of Alternative 4 (Accelerated Completion)

Unavoidable adverse impacts for Alternative 4 would be similar to those described for Alternative 3. Intensive rehabilitation efforts and traffic management under this alternative would result in unavoidable adverse economic effects to businesses from a reduction in Park visitation.